

MARCH 11, 1987

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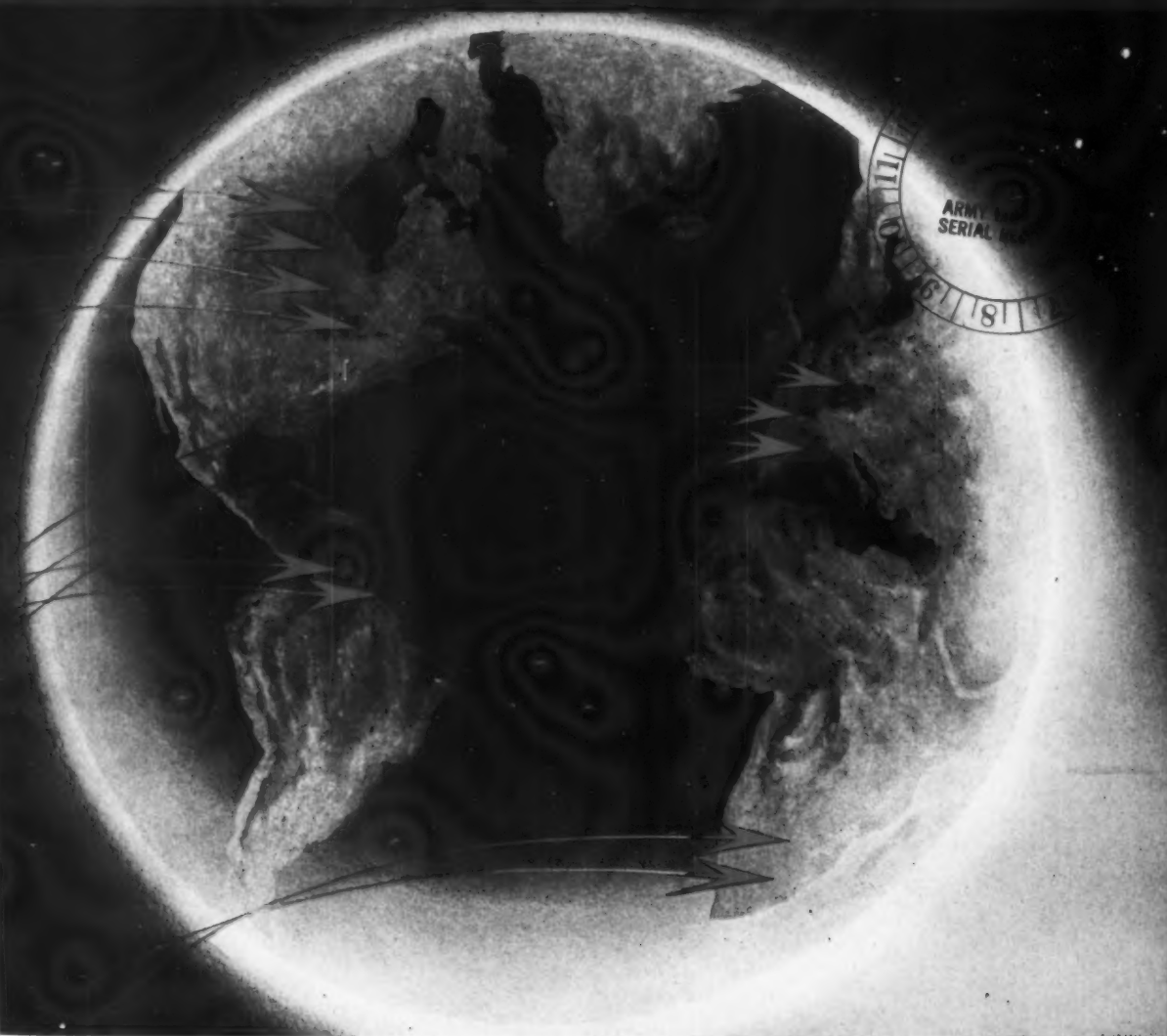
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MARCH 11, 1957

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WHEN-WHERE

MARCH

- IAS Flight Propulsion Meeting** (classified), Hotel Carter, Cleveland, Mar. 14-15.
- IRE National Convention**, Waldorf-Astoria, New York City, Mar. 18-21.
- Gas Turbine Power Conference**, sponsored by ASME, Sheraton-Cadillac Hotel, Detroit, Mar. 18-21.
- American Society of Tool Engineers**, Silver Anniversary meeting, Shamrock-Hilton Hotel, Houston, Tex., Mar. 25-27.
- Western Metal Exposition and Congress**, sponsored by American Society for Metals and other technical groups, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Mar. 25-29.

APRIL

- SAE Aeronautic Meeting and Production Forum**, Hotel Commodore, New York City, Apr. 2-5.
- American Rocket Society**, national annual spring meeting, Sheraton-Park Hotel, Washington, D. C., April 4-6.
- ATA Air Traffic Conference** annual meeting, St. Charles Hotel, New Orleans, Apr. 10-11.
- IRE Professional Group on Telemetry and Remote Control**, national symposium, Philadelphia, Apr. 15-17.
- Arnold Air Society** annual conclave honoring 50 years of military air power, Hotel New Yorker, New York City, April 17-20.
- Jet Engine Hydraulics Symposium**, sponsored by Vickers, Inc., Hotel Statler, Detroit, Apr. 22-24.
- International Airline Navigators Council** annual conference, Hotel Piccadilly, New York City, Apr. 23-25.
- Airport Operators Council**, Conrad Hilton Hotel, Chicago, Apr. 28-May 2.
- Flight Test Instrumentation Symposium**, Statler Hotel, Los Angeles, Apr. 29-May 2.
- National Materials Handling Exposition**, Convention Hall, Philadelphia, Apr. 29-May 3.
- Society of Aeronautical Weight Engineers**, annual national conference, Broadview Hotel, Wichita, Kas., Apr. 29-May 2.

MAY

- Aeronautical Training Society**, annual meeting, Mayflower Hotel, Washington, D. C., May 2-3.
- American Assn. of Airport Executives** annual convention, Shamrock-Hilton Hotel, Houston, Tex., May 5-8.
- Aero Medical Assn.** 28th annual meeting, Shirley Savoy Hotel Denver, May 6-8.
- American Helicopter Society**, annual forum, Sheraton-Park Hotel, Washington, D. C., May 8-11.
- Armed Forces Communications and Electronics Assn.**, convention, Sheraton-Park Hotel, Washington, May 20-22.
- Design Engineering Conference** of American Society of Mechanical Engineers, Coliseum, New York City, May 20-23.
- Aviation Writers Assn.**, annual convention, Chase and Park-Plaza Hotels, St. Louis, May 26-June 2.

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Lead-time still a big question mark

Pentagon study group hopes it has come up with a solution that would cut the conception-to-design cycle. For analysis, see Page 21.



How Chance Vought assembles F8U

Navy's Crusader was engineered for production even before the prototype was built. For picture story, see Page 36.



Some new pictures of old, new aircraft

Last of the famous Douglas AD series has left the assembly line; and a new series of B-66s has begun. A picture feature on Page 57.



TCA made thorough study of jets vs. turboprops

What this successful Canadian airline did before arriving at its big decisions is the story of a real jet enthusiast, as told on Page 83.



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**WESTERN
AIRLINES**

Invisible deterrents are meaningless

PENTAGON SECURITY officials should have this sign on the walls of their offices: "The concealed weapon deters no one."

It is an obvious principle, yet one which is sadly overlooked in most cases of Pentagon security censorship. It was most recently voiced by Dr. Louis Ridenour, Director of Research and Development for the Missile Systems Div. of Lockheed Aircraft Corp., in a speech before the Air Force Association's Jet Age Conference.

Military officials, said Dr. Ridenour, frequently take the view that secrecy, in and of itself, is a virtue which should be sought at all times. Such an attitude is self-defeating, he explained. It overlooks the principle that a genuinely secret weapon is absolutely worthless in peacetime. While it may be of value in pulverizing an enemy in event of war, it does nothing to convince him that war should be avoided. And a war, even should it be won in the long run, would represent a failure of one of the major objectives of U.S. policy.

Of course, this does not mean that the U.S. should open all its plans to examination by a potential enemy. Codes, detailed operating doctrines, technological breakthroughs in their embryonic stages and other types of information which would permit the potential enemy to focus his own effort with maximum economy should be withheld.

But there is an enormous volume of information which does not fall in this genuinely sensitive category but which is nevertheless rigidly censored by the security G-men. Keeping the deterrent value of certain types of information in mind, we submit that the nation could derive greater benefit by relaxing rather than tightening its restrictions on the flow of data in such fields as general aircraft and missile performance, development progress on new weapons and operational readiness with existing weapons.

There is another aspect to the matter which has received little or no public consideration. That

is the fact that new weapons are racing so hard on the heels of existing technology that in many cases it is necessary to open whole new fields to accommodate their development. In short, U.S. technology is becoming tailored to its new weapons, just as the weapons themselves are tailored to their missions.

If this is the case in the U.S., it seems likely that the Russians are also encountering the same thing. It is therefore at least questionable whether a nugget of information on U.S. research and development would be of the same benefit to the Russians today as it might have been to the Germans during World War II. If, for example, a new U.S. missile development program creates a host of unique requirements for testing facilities, production techniques and tools, it is doubtful whether the information reaching the enemy on such a program would be of much material assistance to him during his current development efforts, since these, in turn would have generated their own unique technological requirements which might not be geared to duplicate the U.S. approach, much less profit from it.

Aside from the question of the practical value of information to an enemy, there is the serious question of the price which the U.S. must pay for clamping down on its flow to scientists and engineers. Dr. Ridenour has warned that suppression of the free publication of technical information produces this paradox: it will hurt the U.S. more in those fields in which its technical competence is greater than the enemy, and less in those fields in which it is lagging.

"In the interests of security by achievement, as opposed to security by concealment, we should probably communicate as widely and promptly and effectively as we can the results of our massive current research and development program," he said. "To do less is to confess that our total development capability is inferior to that of our potential enemies."

To repeat, the concealed weapon deters no one.

Crisis for air traffic controllers

A CRISIS INVOLVING air safety is at hand. The CAA is losing air traffic controllers at a shocking rate. The morale of the controllers is at a low ebb. The outlook is far from good.

The reason is not hard to find. The Civil Service Commission recently reclassified the air traffic controller jobs. In effect the CSC rates them along with bookkeepers. Their positions were downgraded. It was one of the most bungling, unrealistic reclassifications in bureaucratic history. The CAA fought a reasonably stiff battle but lost. It would have been better if CAA had refused to accept the verdict.

A 2-year moratorium was put into effect prior to the reclassification going into full force. But one CAA region in a tactless blunder jumped the gun on downgrading controllers with resultant loss of personnel and morale.

How serious is the problem? Plenty. At one major traffic point, the toll of resignations among

radar approach controllers has reached 33%. Experienced men in control centers feel there is no more future. They like their work, they know its importance, but they can earn more elsewhere. They have accepted some sacrifices but the limit has come with the CSC action.

What an irony that air traffic controllers are being downgraded at a time when midair collisions are increasing and safety is a major stake. A cold bureaucratic approach was taken on a matter where experience and skill is of the greatest importance.

Job evaluation problems, fortunately, don't get completed overnight. Although CAA has already lost good men, immediate steps can be taken to correct the blunders. Congress should step in at once. The air traffic controller is a key man—a very key man—in the entire air traffic control problem.

The crisis is difficult to overestimate.

Wayne W. Parrish



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LETTERS

Single Traffic Control?

To the Editor:

Your editorial "Inevitable: A Single Traffic Control Agency" in your February 11 issue appears to me to be somewhat confused.

So far as I know, there has never been anything other than a single air traffic control agency, and it is operated by the CAA. It is true that the military frequently flex their muscles and try to get out from under this control, but don't construe that to mean that the military have the authority to operate air traffic control on their own.

They don't, and the statutory responsibility for air traffic control in the United States rests with just one agency and no other. When the military do operate their own traffic control facilities (such as RAPCONs), they do this only under the delegation of authority from the CAA.

Because they are the sole traffic control agency in the United States, the CAA can revoke that delegated authority at any time. Max Karant, Vice President, Aircraft Owners and Pilots Assn., Washington, D. C.

(Editor's note: Let's face it, CAA's position is not that strong. Witness: Congress' recent study of the statutes uncovered a Supreme Court opinion that even the Civil Air Regulations under which CAA operates are limited in their jurisdiction over military aircraft.)



Aerial Traffic Lights

To the Editor:

Your Personal View in the February 11 issue of AMERICAN AVIATION on "A Single Traffic Control Agency" is most interesting. It is also understandable since your magazine claims to be the "Voice of the Industry since 1937."

You are right in one respect, though. There cannot be a different kind of traffic control for each different kind of air traffic. They should all follow the same rules for the good of the majority, and all . . .

You say a traffic light system in a city with only part of the traffic subject would be absurd. How true. The Jaguars, trucks and jeeps should all have to obey both the same traffic lights and traffic laws. Why not also then the jets, the airliners and the cubs?

Would it also then be practical to put a traffic light or a cop on every country crossroad, or just say to the jeeps and the motorists: "You have to stay off for the good of the country's economy"? Is this necessary, desired or the goal of positive, complete or single air traffic control?

You say control is necessary for the good of all, dominated by "only" the major interests of the country. What are

the major interests of the country? Aren't they the interests of the majority who are going to use the airways? I think the public and the aviation industry will perhaps, or at least should, wake up and see the true facts, when the results of a recent nation-wide traffic survey are widely known. The fact that in actual usage, private and corporate planes greatly outnumbered all commercial and military put together (over 8 to 1).

Also, as of June 1956 only 2% of the country's 86,000 civil aircraft were airliners and only 29% were owned by the airlines and corporations.

Private flying may not shout the loudest or have the biggest tax-exempted publicity departments, but they are up there—and in the majority!

Rather than to be called crackpot critic, I believe a few practical concrete suggestions might be in order. Why would not at least some of the following be practical:

1. Areas, restricted and designated (as only recently suggested) for commercial testing, restricted from all civilian and military flying.

2. Minimum levels for jet traffic. Minimum of say 15,000 ft. outside specified definite control areas for takeoff and landing, since jets and airliners are oxygen-equipped and pressurized.

3. Speed limits in high-density control areas, say a radius of 50 miles. We don't let our few trucks and busses tear through our towns at 60 mph. Why should the 2% do so in the air?

4. Realistic federal requirements and training for private pilot's education and licensing in view of today's modern planes, radios, etc. How often are thousands of dollars spent on planes and equipment and yet little or none on knowledge (living insurance) to keep the nut behind the wheel under control? All our present laws and regulations allow this however. Perhaps they should be students with certain limitations until more realistic exams and proficiency can be demonstrated. CHARLES H. LOOMIS, M.D. A Private Flyer, Richmond, Ind.



TUCSON AIRPORT AUTHORITY expected to have under contract this month construction of this 11-story control tower and operations building, to be located on the east side of Tucson's Municipal Airport. Cost: about \$408,000.



Honeywell Aero's HIG-6, one of the most precise gyros ever designed, is now in quantity production. With a drift rate of less than 0.1 degree per hour, it represents the furthest advance yet made in a production, inertial-type gyro. The HIG-6 is applicable to both full inertial and aided-inertial systems. Standard models of this gyro can be delivered in as little as three months' time.

AERONAUTICAL DIVISION, MINNEAPOLIS-HONEYWELL

dear boss . . .

you, the reader, really own this magazine. So, you ought to know what we've been up to recently. Actually, it all started more than a year ago. We hired the best publishing consultants in the business. "Tell us what we're doing now that we can do better," we said. "Show us what we ought to be doing that we're not doing. Stick your nose into everything." Believe us, they did. Then, finally, when we were sure we were ready, we picked this issue to start our parade of progress . . . from the easier-to-get-at "Contents Page" . . . the fresh, fast-sparking "Airtrends-Digest-Washington Trends" on special paper (late to bed, early with the news) . . . to favorite features with scrubbed faces, bigger and better pictures, new eye-comfortable type . . . and a lot more. And lots more to come, too . . . for this is a continuous job of product improvement, dedicated to giving you more for every precious minute you invest reading this magazine. So, while we keep driving the printer crazy, perhaps you'd like to let us know how you like what we've done so far.

Wayne W. Pamich

EDITOR & PUBLISHER



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AIRTRENDS

Complete new evaluation of Air Force's R&D program is planned for later this year. Objective: to reappraise certain strategic weapons in relation to total AF program and to reassign priority ratings in light of progress made. Evaluation will reflect USAF's answer on how to stretch restrictive funds for maximum benefit.

Big items to be scrutinized by AF: whether to discard Navaho missile program completely, or accelerate it; how to proceed with chemical and nuclear bomber programs: how far to go with Republic XF-103 project; how far to program next generation of century series fighters.

Fly in the ointment may be new Defense Research and Engineering office headed by Frank D. Newbury. His past performance has been against "bold new steps," instead favoring the "tried and true."

Production troubles and development difficulties may have bogged down Russia's Bison heavy bomber. Defense Secretary Charles Wilson hinted as much in recent discussion of the reappraisal of the number of Bisons available to the Russians.

It now appears that Russians had no more than 50 Bisons last May when U.S. intelligence indicated they had more than 100. U.S. presently has more than 150 B-52s. Wilson denied flatly that downward revision in Bison estimate is related in any way to Administration's tight airpower program and said the reappraisal had nothing to do with Symington hearings of last summer.

Share of Army's procurement dollar earmarked for guided missiles is climbing even more sharply than funds of other services. Army expects almost 50% of its fiscal 1958 procurement and production request will buy missiles, compared with 23% in fiscal 1956.

USAF officers have been criticized for asking industry to finance special USAF exhibits. Need for funds arose when USAF learned that management of recent National Plant Maintenance and Engineering Show in Cleveland would drop past practice of providing free space for USAF display.

A USAF project officer approached industry for funds. Protests reached Senate Preparedness Investigating Subcommittee, which notified USAF Secretary Quarles. USAF funds were quickly allocated for the display and personnel were warned against future "solicitation."

Extreme difficulties encountered in A-plane development have been laid at the feet of industry by blunt RAdm. Hyman Rickover. His charge: manufacturers are unable to understand even the fundamentals involved in straightforward application of products and engineering.

Main limiting factor in exploitation of nuclear power, says Rickover, was failure of industry to meet exacting standards, even in conventional materials and equipment. Although specifically referring to nuclear-powered ships, his criticism was taken to heart by the aircraft industry.

Reason: There at least has been a breakthrough in ships—but nothing foreseeable in aircraft.

DIGEST

SAS writes aviation history with first commercial polar route flight to Far East

by Wayne W. Parrish

TOKYO—Scandinavian Airlines System chalked up more than one record when it inaugurated its Europe-Far East route over the North Pole on Feb. 26.

Not only did it set in motion a new trade route which is destined to be of historical importance, but it established a new high in world air transportation in promoting the route.

With a budget of \$400,000 and two years of planning, SAS captured world attention and established itself as the pioneering air service in the polar regions.

Never has an inaugural been so well organized and never has one operated so smoothly. A very great measure of credit must go to J. B. Walker, of Walker & Crenshaw, public relations firm of New York City, for masterminding much of the strategy behind the route opening. John Walker is an old hand in the airline business—TWA, United and Braniff—and showed his skills in working out a program unprecedented in airline promotion.

The SAS program was as bold as its actual venture in flying over the pole. Newspaper, radio and TV representatives from a dozen or more countries participated. Coverage was probably the greatest in airline history. No

angle was overlooked, even to the important item of having members of the Japanese royal family fly on the first eastbound flight. This was no small feat in itself.

SAS put all of its resources behind the bold gamble of pioneering a route over the top of the globe. It was a gamble that paid off. There is no reason why the route won't be a resounding success, just as was the Los Angeles-Copenhagen route. By Feb. 28 there were some 600 firm bookings, 400 westbound and 200 eastbound, for the twice-a-week service. There are untold thousands of people from all over the world who would like the experience of flying over the pole. But more important, the new route shaves about 20 hours and some 3,000 miles from existing services between Denmark and Tokyo.

SAS advertises the route as a 30-hour hop, but actually the flying time will come closer to averaging 32 hours, plus the refueling stop at Anchorage. There will also be times when the flights will have to stop for refueling short of the mark.

For example, the first eastbound inaugural had to land at Oslo for fuel because of headwinds. The second westbound flight landed at Fairbanks

for the same reason. But these are relatively simple operating problems which do not detract from the advantages of the route between east and west.

Probably the biggest single factor in keeping these operating problems to a minimum is the effort expended by SAS in developing fool-proof navigation over the polar regions.

For this operation, the airline uses astro-navigation pioneered in its transpolar Copenhagen-Los Angeles service. Here, key pieces of navigation equipment are the Polar Path Gyro developed by Bendix Eclipse Pioneer division and a "sky compass" produced by Kollsman Instrument Corp.

The Bendix unit permits the SAS navigator to set his gyro in a given direction and have it stay there. Its heavy tungsten flywheel, electrically powered to turn at 23,000 rpm, remains fixed in space for 20 hours.

The Kollsman device makes its big contribution during periods of Arctic twilight when the sun is below the horizon, but its rays are still too strong for star sighting. Operating on the principle of polarized light, the sky compass determines the direction of polarized rays of the sun reflected on the earth from the sky and gives the navigator the sun's position.

Unlike its initial transpolar operations to Los Angeles, the Tokyo service began with the benefit of what is still virtually a new airplane to SAS. The Tokyo "Global Express" is flown with Wright Turbo Compound-powered Douglas DC-7Cs, first of which was delivered to SAS last August and introduced into Copenhagen-Los Angeles operation in October.

ARDC studies foreign runway cleaners

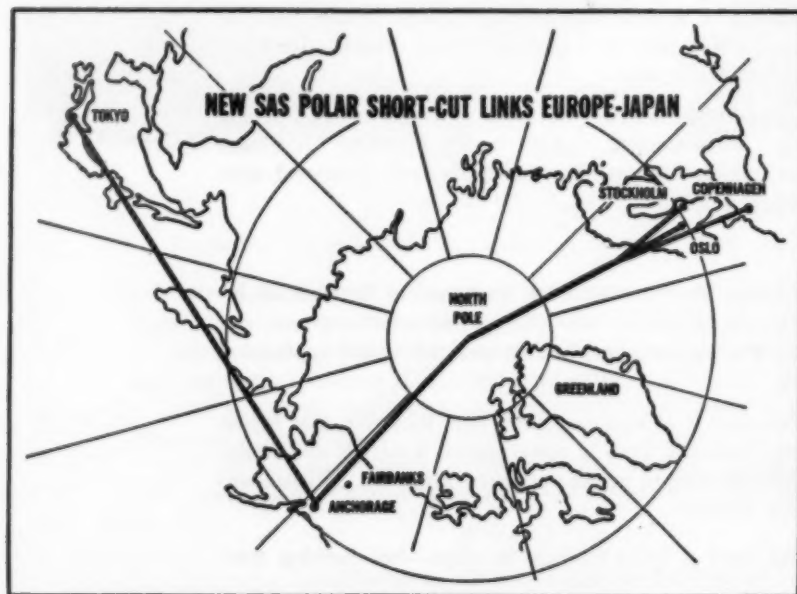
Cleanup of an estimated \$25-million annual bill for damage caused by runway debris being sucked into jet engines is the goal of a project being tested at Wright-Patterson AFB.

Under study are two American-made high-speed runway cleaners and two European-built models.

The two continental cleaners—the Italian Belotti and Swedish Berro-Car—are being evaluated against the American versions to see if they have new features that might add to the capabilities of the U.S. prototypes. In their present form the Italian and Swedish cleaners do not conform to the specifications made by the Air Research and Development Command, which is conducting the tests.

It is believed by ARDC officials, however, that the foreign makes could be revised to reach the requirements but that this may take as long as development a new type.

The American vacuum cleaners (they do not have sweepers) were built by Wayne Manufacturing Co. and Coleman Engineering Co. at the request of ARDC.



Wilson confirms 'cancelation' of Jupiter but says Redstone work will be finished

Defense Secretary Charles Wilson last month confirmed that the former Army Jupiter mid-range ballistic missile has been canceled as a weapon system, but he told a press conference that the scientists of Redstone Arsenal "are going to finish up the work that was laid out to test a number of different principles and the items of hardware."

News stories resulting from Wilson's discussion of the Jupiter project prompted the Pentagon to issue a statement the next day declaring that the Jupiter will continue "side by side" with the Air Force Thor IRBM until an evaluation of the capabilities of the two missiles is made. It is understood that concern expressed by officials at Redstone Arsenal led to the statement.

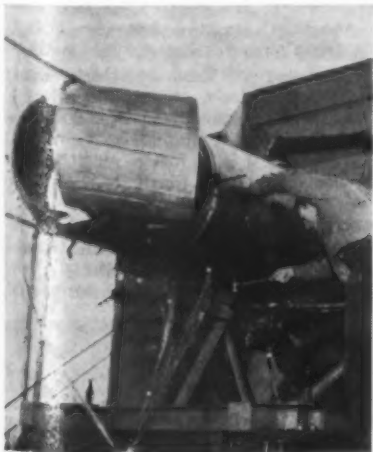
Wilson, however, made it clear that the decision on how much of the Jupiter will be incorporated into the final production model IRBM rests largely with the Air Force. He said the final weapon "might be just as close to the Jupiter missile as it would be to the Thor missile" and that it is impossible to say now which companies will supply the components for the finished weapon.

Curtiss-Wright unveils jet thrust reverser

Curtiss-Wright Corp. has unveiled a jet engine thrust reverser that company engineers estimate will reduce critical landing distances 50% in future turbine transport operations.

Designed and developed from model research through full-scale engine test by C-W's Research Division, the thrust reverser will be built by the corporation's Propeller Division.

Feature of the reverser is that it



THRUST REVERSER at position between full forward and full reverse is shown on model being tested at Curtiss-Wright R&D Center at Quehanna, Pa.

"It all depends upon what the Air Force does after we go through this range of testing, get all the information we can about the guidance system, the motors, the nose cone and the re-entry business, and . . . then lay down the missile we are going to build and who is going to build it," the Defense Chief said.

Despite Army objections to the interpretation of Wilson's remarks (he said the Jupiter is canceled as a "permanent thing"), most observers agree there is little prospect that much of the Jupiter system will be incorporated in the production IRBM, and therefore that the contractors now working on the Thor stand an excellent chance of getting production contracts if the weapon is tested successfully.

Wilson said it is not clear whether additional funding will be required for the Jupiter in fiscal 1958, noting that some of the fiscal 1957 financing supplied by the Army will still be available after next June 30. He said his special assistant for guided missiles, Eger V. Murphree, is preparing a recommendation as to "what degree we will finish up any hardware or tests that we clearly started to prepare for."

can be precisely controlled to answer the pilot's command for any thrust from 100% forward to full reverse. This enables the pilot to use the reverser for in-flight control, landing on short runways and ground maneuvering.

Time of operation of the reverser from full forward to full reverse is less than two seconds. It does not interfere with the exhaust nozzle or tailpipe of the engine, nor does it increase drag, according to C-W.

Studies of thrust reversers have been conducted by Curtiss-Wright since August 1952. Tests of more than 200 scale-models have been conducted to determine suitability of various types for engines with and without afterburners.

Firestone to produce launching system

Design, manufacture, testing and installation of a missile launching system for Navy submarines is being undertaken by Firestone Tire & Rubber Co. The work will be done at the Firestone Engineering Laboratory, Guided Missile Division, Monterey, Calif.

The launching system is for Chance Vought's Regulus, 30-foot, seven-ton, surface-to-surface missile capable of carrying an atomic warhead. Components of the Firestone system are the launcher itself, handling and stowage equipment. First two of the systems will be installed on the subs "Grayback" and "Growler."

The new system is expected to

extend the Navy's submarine capabilities into the realm of supersonic missiles of great strategic importance, Firestone said. The company is also producing the Corporal surface-to-surface Army missile.

PAA 707 'nose' moved



NOSE SECTION of the first Boeing 707 jet airliner slated for commercial use has been moved from its jig to the head of the production line at Boeing's Renton, Wash., plant. Pan American World Airways will receive the transport late in 1958. PAA and ten other airlines have placed orders for 134 of the 707's.

Westinghouse develops new heat-resistant alloy

Westinghouse Electric Corp. has developed a new heat-resistant alloy designated W545. D. W. Gunther, manager of the company's materials engineering department, says that when the material was heated to 1200°F and subjected to a stress of 75,000 pounds per square inch, test samples withstood these conditions for as much as 300 hours without breaking.

The company believes that the new alloy will find its greatest use as a turbine disc material.

Experts study reliability



THREE EXPERTS discuss component reliability at the Western Joint Computer Conference, sponsored by the Institute of Radio Engineers, the American Institute of Electrical Engineers and the Association for Computing Machinery: Dr. John L. Barnes (left), president of Systems Laboratories Corp. and chairman of the conference; Dr. Arthur L. Samuel, research advisor to International Business Machines, Inc.; and James M. Bridges, director of electronics, Office of the Assistant Secretary of Defense.

WASHINGTON TRENDS

AF's new procurement policy

After sharp congressional prodding, Air Force last week agreed to try a new way of negotiated procurement that will hew closer to the sealed-bid technique. Proposal is the work of John Courtney, counsel for the House Armed Services Investigation Subcommittee, which is probing AF procurement policies.

Cautious USAF procurement officials, after week-long hearings, tentatively accepted the idea. Here's the way it works:

Air Force would solicit technical proposals on a defense item from a number of potential contractors. Following evaluation of the proposals, AF would call in a number of acceptable firms for sealed bids. Low bidder would get the job, eliminating drawn-out negotiations that now afflict AF buying.

Chairman F. Edward Hebert (D-La.) asked for a progress report in 30 days, but Brig. Gen. William T. Thurman, Air Materiel Command, warned that an adequate trial may take longer. Policy would likely be confined to smaller contracts. (See page 27.)

What's in a name?

Sometimes the ways of Pentagon security officials are stranger than the ways of the gods.

Take the case of the nuclear-warhead air-to-air missile announced recently by Defense Secretary Charles Wilson. Originally this Douglas bird had the somewhat improbable name of Ding Dong. When that leaked out, disgruntled USAF security officials gave it a brand new moniker—High Card—presumably fearing that unauthorized disclosure of the first name would compromise the program.

Second name also leaked, so the security men pulled another change and now the weapon is known ingloriously as the MB-1. Nobody knows what the initials stand for, but it doesn't make too much difference since it probably will prove no more durable than its predecessor.

Bermuda bilateral deadlock

Abrupt termination of U.S.-British bilateral agreement talks in Bermuda may affect other bilaterals scheduled by State Dept. the next few months.

Bermuda produced a deadlock, apparently due to British demands for a route to the U.S. which were unacceptable to the American delegation. Since several Washington-bound air delegations are likely to make similar demands, the U.S. will be in a difficult position. It had been hoped the Bermuda conference would produce a prototype modified agreement that could serve as a pattern for new or revised bilaterals with other nations.

Next talks for U.S. will be with the Netherlands. Dutch start talks in Washington March 18, with a route to Los Angeles for KLM as their No. 1 target.

Snyder goes to Pentagon

Nomination of Murray Snyder as Assistant Defense Secretary of Public Affairs came as a pleasant surprise to the Pentagon press. In contrast to his predecessor, Robert Tripp Ross, Snyder is an experienced newsman. In his post as Assistant Presidential Press Secretary, he has been tutored by a veteran government information specialist—James Hagerty.

Rather than playing the role of super censor, Snyder is expected to inject a note of sensibility into the muddled Pentagon information policies and practices.

His starting date hinges on Senate confirmation, but no hitch is expected.

Official missile definition

When is a guided missile a guided missile? Joint Chiefs of Staff finally have come up with an approved and official definition: "A guided missile is an unmanned craft, flying above the surface of the earth containing mechanism capable of altering trajectory in flight."

Missile age also is producing some new Pentagonese: Missilry, missilized, missilated, missileers, missilemen and other missile-any.

Battle over A-plane stretchout

Despite Defense Department endorsement of the A-plane stretchout, certain atomic-minded Congressmen will fight to restore it to top priority. They've blasted Secretary Wilson's plans to merge R&D and engineering into a single office, labeling it a blow to development of the nuclear plane.

Reps. Carl Durham (D-N.C.) and Melvin Price (D-Ill.) are threatening to "Rickoverize" the atom-plane project—that is, hand it over to a special administrator who would shepherd it through to completion. Claims by members of the Joint Congressional Atomic Committee, however, conflict with the Pentagon's reasons for the stretch-out.

Both Wilson and AF Secretary Quarles resent uninformed meddling, insist the ANP project is getting all the attention it merits. Wilson has gone even further, contending it would take "a miracle or two to make a real good device of it." Until researchers achieve a breakthrough, he maintains, project should be held at its present stage.

Pentagon attitude has also irked Senate A-plane boosters. Armed Services Committee Chairman Richard Russell (D-Ga.) doesn't like the cut-back, says Congress may move to set aside special funds.



SPOTLIGHT

DB-47 is the Air Force designation of the Boeing Stratojet slated to carry the Bell Rascal Missile (AMERICAN AVIATION, Feb. 11, p. 21).

Project Gargantua is the name for one of key activities at Piasecki Aircraft Corp. and presumably describes its flying crane study project.

Air Force is closely watching estimated unit production costs on Bomarc missile before release of contract to Boeing, hence recent thumbs down on establishment of a new California facility. Reason: AF is apprehensive that the Bomarc now isn't as modern a weapon as newer vehicles coming along; its 125-mi. range, for example, is only slightly better than the Nike Hercules. Also, USAF is sponsoring an advanced Bomarc with better than three times the range of present missile. As a result, production of present Bomarc probably will not exceed 1,000 units, a small number by Nike production standards.

Lockheed Electra may not be the only turbine transport on which American Airlines will apply its "living room" cabin theme. Boeing reportedly was ready to release seat specifications to manufacturers on 707 recently when AA interjected the possibility its interior wouldn't use standard seating.

Russia soon will place in service day fighters using both rocket and jet powerplants. These aircraft reportedly are faster than any U.S. fighter approaching production stage, probably will fly 1,800 mph for short periods.

Red Air Force also is expected to get a new supersonic twin-engine all-weather fighter soon, but this aircraft's efficiency is limited by Russia's lag in development of high-performance airborne radar.

Convair is scheduling delivery of the first forty 880 jet transports to TWA and Delta by September 1960, following CAA certification in May that year.

An Allison T56 has logged 600 hours of simulated airline operations. Engine, military version of the 501 D-13 that will power the Lockheed Electra, is logging 15 hours daily in operations similar to that flown by an airline, including start, taxi, takeoff, climb-out, cruise, letdown, prop reversal and 20-min. shutdown between "flights."

Capital Airlines will get the 60th and last of its original order of Vickers Viscounts this month. Airline has ordered an additional 15 to be delivered by August.

Fairchild now has firm orders for 60 F-27 Friendships, according to Civil Aeronautics Board, but company declines to give exact figure. Last reported totals were 44 firm orders, 29 options.

Goodyear Aircraft has developed two thrust reversers for Air Force. AF reportedly is well satisfied with both designs.

Convair 880 will use approximately 3,100 square feet of solid honeycomb construction in all control surfaces, flooring, internal bulkheads and many access doors. Honeycomb structures, saving weight and insuring stiffness of external skins to prevent oil-canning in flight, will be made with aluminum skins bonded to aluminum cores with a thermosetting adhesive. Fiberglass honeycomb sandwich also will be used in nose radome.



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Systems Evaluation Engineers test and evaluate electronic analog and transistorized digital computer systems design for aircraft; evaluate new systems and improvements to insure compliance with specifications and Air Force requirements. Other assignments: tie-in testing of peripheral equipment, liaison with design, development and field engineering. *Do you belong on this team?*



Harry Branning (center): B.S.E.E. 1950, Syracuse. Design Engineer in circuit design, 1951; October, 1954, promoted to Associate Engineer; April, 1956, promoted to Staff Engineer, Systems Planning. In June, 1956, appointed Project Engineer and Manager of the 110 Computer Circuit Design Department; discussing the performance and packaging details of a transistorized read amplifier.

William Dunn (standing): M.E. 1950, M.S.E.E. 1952, Stevens Institute. Technical Engineer, 1955; April, 1956, promoted to Associate Engineer; August, 1956, transferred to Development Engineering in charge of Logical Design for digital computers in advanced weapons systems; here discussing Boolean Algebra method of optimizing the logical design of an airborne digital computer.

Eli Wood (left): B.S.E.E. 1950, Connecticut. IBM Customer Engineer, July, 1950; September, 1952, transferred to ACL Field Engineering. February, 1954, in charge of Field Engineering at Hunter AFB; May, 1955, Associate Engineer; appointed Project Engineer, Manager of Systems Evaluation in August, 1956; here investigating a problem in radar data presentation set evaluation testing.

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Systems Analysts anticipate performance and recommend design criteria before and during development of equipment. Later, they compare dynamic performance accuracy and reliability characteristics with what has been anticipated. Other assignments include Digital Computer Systems Engineering, Input-Output and Analog-Digital Conversion Engineering. *Do you belong on this team?*



Quentin Morble (left): B.S.M.E. 1951, Syracuse. Joined IBM in 1951; promoted to Design Engineer in 1952; May, 1955, promoted to Associate Engineer, and then to Project Engineer, Manager of the Systems Coordination and Specification Group, Production Engineering Department, in February, 1956; shown here describing a unique cooling design to a new employee in his group.

Monroe Dickinson (left): B.S.E.E. 1952, W.P.I.; M.S.E.E. 1954, M.I.T. Technical Engineer in analog and alternate computer techniques for weapons systems, 1952; Associate Engineer responsible for systems design and analysis, 1954; December, 1955, Staff Engineer, responsible for research planning; here reviewing set-up on laboratory analog computer of a sampled data control problem.

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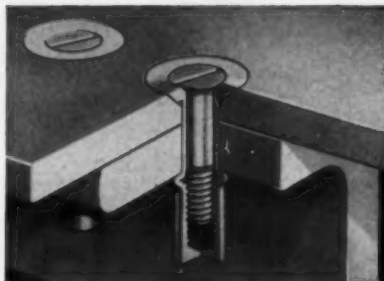


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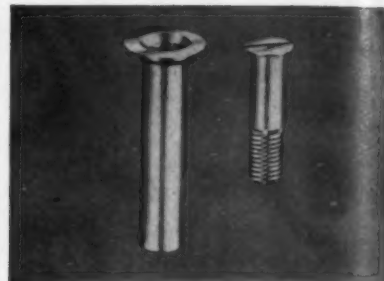
solves tough sealing problems



PROBLEM—Designing the Grumman F11F-1 Tiger, using skin panels for integral wing tanks, required a strong leak-proof blind fastener.



SOLUTION—Installed from one side, a Seal-Head Rivnut with rubber "O" ring provides a fuel-tight seal, withstands temperatures from -65° to $+225^{\circ}$ F.



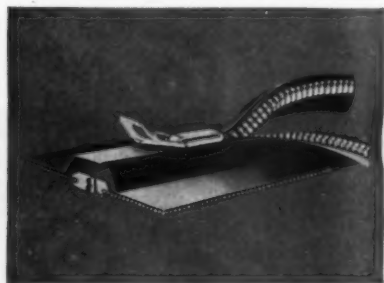
B. F. Goodrich Seal-Head Rivnut is approved for primary structure. Special high tensile screw adds reinforcement after installation.



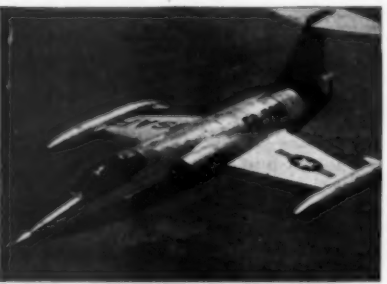
PROBLEM—Baggage compartment panels in Lockheed's Super Constellations had to seal out air, yet open easily for servicing of equipment.



SOLUTION—B. F. Goodrich baggage panels with Pressure Sealing Zippers zip open quickly, form flexible, air-tight bulkheads that withstand abrasion, impact.



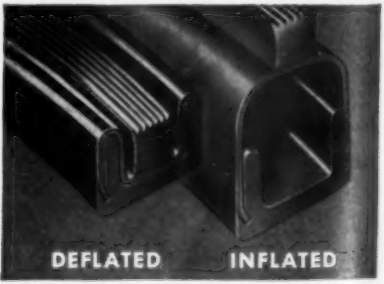
B. F. Goodrich Pressure Sealing Zippers have molded rubber lips that overlap with hairline precision. Three styles, two sizes, solve tricky sealing problems.



PROBLEM—The Lockheed F-104 required a lightweight canopy seal adaptable to compound curvatures, and offering high flexibility at low temperatures.



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Lead-time . . .

Industry's big question mark

Pentagon Study Group's recommendations may shorten concept-to-inventory cycle by improving procedures

by Henry T. Simmons

THE PENTAGON'S Aircraft Study Group wound up its existence last month after a long search for ways to compress lead-time in the design, development and production of manned aircraft weapon systems.

Its principal conclusion: the concept-to-inventory cycle for new aircraft can be considerably reduced through improved management procedures and without resort to dangerous engineering shortcuts.

In turning the final report over to Defense Secretary Charles Wilson early in February, Reuben Robertson, Jr., Deputy Defense Secretary and chairman of the group, had this to say:

"It has been found that weapon-system development can be accomplished in significantly less calendar time than has been required for weapons developed since World War II. We should not, nor are we attempting this reduction by shortcutting the work of the scientists, engineers and technicians who are responsible for new ideas and the quality of the final product. We can, and we are, moving quickly to eliminate waste motion by streamlining the numerous management and administrative processes involved."

Three Areas Covered

The recommendations of the Robertson group, together with the steps taken by the Air Force, Army and Navy in complying with them, fall into three broad areas:

Development of a firm requirement for a new aircraft weapon.

Strengthening the internal weapon system management teams within the military services.

Improvement of design, test, procurement and production procedures.

On the average, the committee wrote, the concept-to-inventory cycle for manned aircraft requires about 10 years. (See accompanying chart.)

About half of this time is consumed in the preliminary stage—statement of the requirements and planning for its development. The committee pin-pointed the following trouble spots and military efforts to correct them:

1. To achieve more systematic and comprehensive planning of future needs, exploit all sources of ideas and prevent requirements writers from dissipating their energies on current projects, the Navy has set up a long-range planning group and developed an air warfare R&D guide for orderly scheduling of planning work. Meanwhile USAF has worked for closer control of voluntary industry research and drastically reduced the time needed for Air Staff approval of new plans.

Both services have made more time available to requirements writers. The Office of Secretary of Defense will improve the Armed Services Technical Information Agency and press for legislation authorizing payment of awards up to \$50,000 for inventive contributions to national defense.

2. To obtain firm decisions on new projects and avoid "half-hearted support . . . with resulting delays and erratic fiscal support," requirements must be precisely and fully stated. Both the Air Force and Navy have established check lists of questions which must be answered by requirements writers, including cost considerations, and both services will put more emphasis on war games and simulation of techniques to provide experimental data as early as possible.

3. In addition to firm decisions on new projects, such decisions must be reached more promptly by top-level executives to assure timely and consistent policy support regardless of budgetary changes.

To this end, both Air Force and Navy have established procedures providing for a continuous flow of new requirements to their secretaries, including detailed military and technical analyses of important or controversial new programs. OSD will seek to reach prompt decisions on roles and missions



NEW WEAPONS-SYSTEM approach will be applied to Martin SeaMaster.

controversies where they might affect important projects.

The second major area permitting lead-time improvements also lies in the military domain—weapon system management within the services. The Robertson group generally backed a more "vertical" alignment of management on new projects in place of the conventional "horizontal" staff alignment favored by the military services. It focused its attention on these spots:

1. The speed and effectiveness with which a project moves through the fantastically complex development cycle is very heavily influenced by the qualifications, rank and authority of its managers. The Navy has appointed 10 program managers with the rank of captain or commander to handle its new aircraft developments and is providing special training for them.

Air Force has appointed one general officer to head its top priority aircraft program and is considering the idea of upgrading all personnel of its Weapon System Project Offices. It is also seeking to strengthen the relationship of the WSPO's to contractors through the plant representatives of the Air Materiel Command.

2. Continuity of top personnel and adequate funds for travel and communications are also necessary to strengthen central weapon system management within the services. Navy has increased the tours of program managers to a minimum of three years for line officers and four years for engineering officers and is providing for longer overlap of incoming and outgoing personnel.

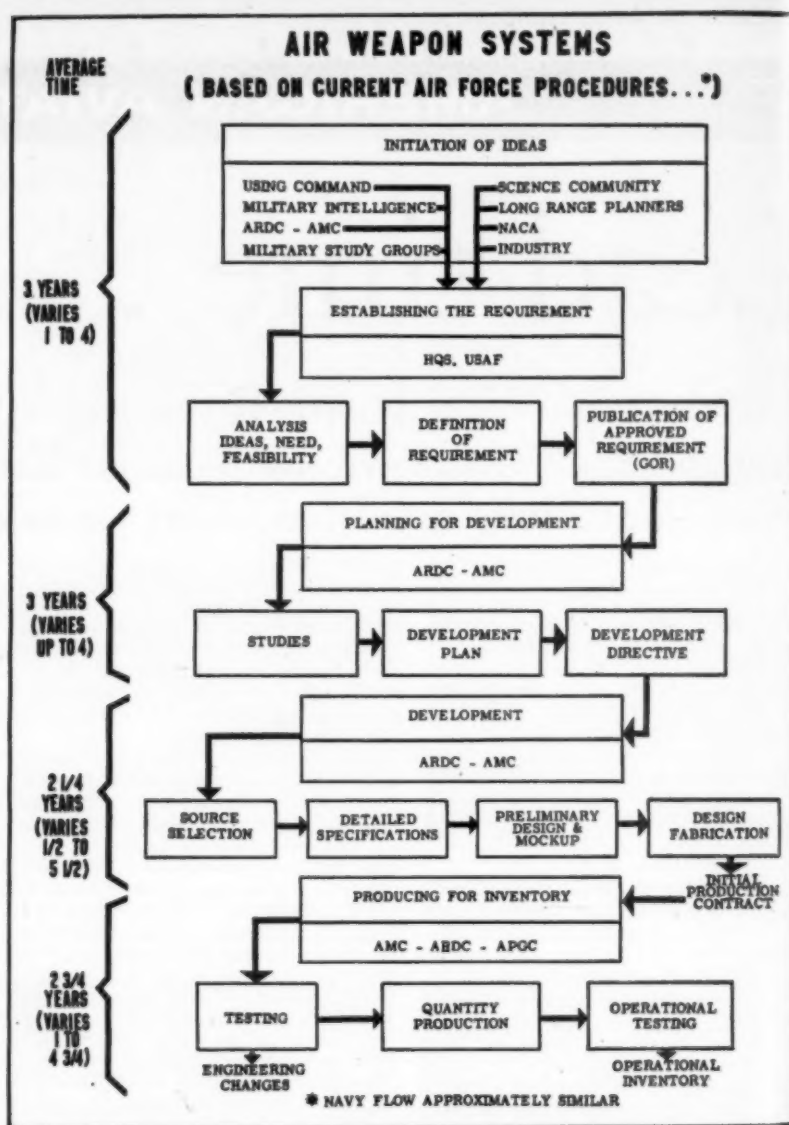
USAF has established minimum tours of four years for officers in materiel positions and three to five years for R&D officers, but extensions may be granted. Both services have taken steps to provide adequate support for program management offices.

3. Closer review of project management by top-level civilian officials of the services will assure the status, authority and administrative support of the program managers. Both USAF and Navy have developed procedures for periodic review of weapon system programs by officials at secretarial levels, and USAF will follow Navy practice in setting up a "Status Room" containing pictures and other graphic evidence of the progress and problems of each project.

Contractors greatly concerned

Of greatest concern to industry are the recommendations and related actions of the services in the area of administrative procedures for the design, test, procurement and production of new equipment. It is in this area that contractors are most profoundly affected by military policies and practices. The Committee discussed problems and corrective action in four trouble spots:

1. *Flight tests* of new aircraft often extend for more than two years; loss of a test vehicle or an inadequate



number of such vehicles will unnecessarily delay this phase of development. Both Air Force, in its Cook-Craigie plan, and Navy, with its "FIRM" plan, have moved to provide up to 25 or 30 initial production models for concurrent testing to accelerate the flight-test phase. Air Force is also expediting the flight-test stage by relying on the contractor instead of its depots for spare part support, with savings of as much as 30% in testing time.

2. *The task of soliciting design proposals* from industry frequently requires a year or more, followed by a period of months during which the services evaluate proposals, and still more months while production contracts are negotiated.

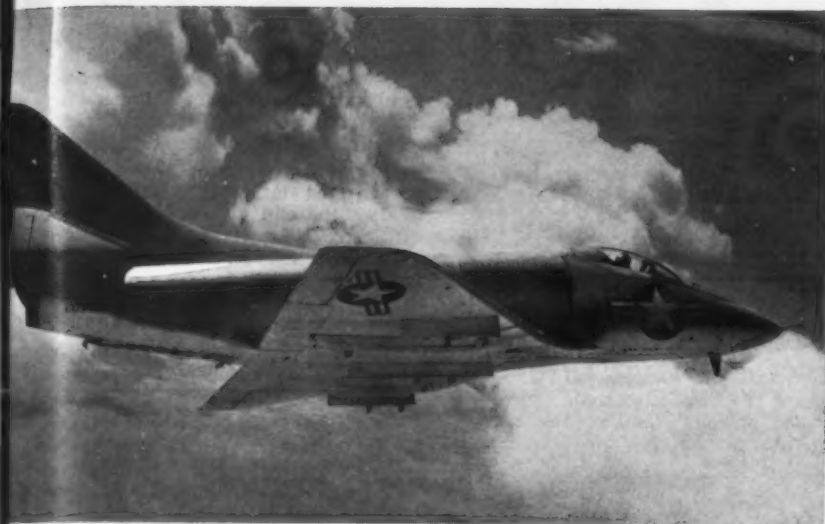
Navy last year began to introduce a variety of changes recommended by industry in 1955 to tighten up and expedite its administrative machinery in this area. These include earlier release of money for tools, advance notice of quantities to be procured, closer sched-

uling of components and a general reduction in red tape.

Air Force has adopted a "Source Selection" technique aimed at cutting out waste of engineering time on design proposals by narrowing competitions to two or three selected companies, and the Navy may copy this approach.

3. *Contractors' requests* for tooling and facilities require as much as 250 days for Pentagon processing. To reduce this time, OSD has delegated to the services responsibility for facilities up to \$500,000 in value and has provided for determination on larger projects in advance of receipt of detailed specifications for acquisition and construction. The services are also working out facilities contracts along with procurement contracts where possible, and they are working out elements of facilities contracts with contractors in advance of OSD approval.

4. *The complexity of government-industry relationships* has increased in



DOUGLAS A4D-1 may feel effect of new approach.

direct proportion to the complexity of new weapon systems; simplification of these relationships is vital if lead-time is to be pared. Both Air Force and Navy permit program managers to handle contractor requests for relaxation of specification requirements.

Navy is giving greater attention to the "weapon system" approach with such new models as the Martin P6M jet flying boat, the McDonnell F4H all-weather fighter, the Douglas A4D bomber and the North American A3J advanced assault aircraft. The two services are taking further steps to expedite engineering change proposals and to reduce the load of reports now required from contractors.

In a letter acknowledging receipt of the report, Secretary Wilson called

attention to two other factors which influence lead-time but which were not discussed by the Robertson group. One is the fact that limitation on resources may delay low-priority projects no matter how well they are handled, and the other is the acute need for wise decisions at the earliest possible stage of the cycle to concentrate funds only upon the most fruitful projects.

The existence of the Robertson committee, organized in October, 1955, formally ended with the submission of its final report to Wilson. The committee noted, however, that each of the services has promised to hold conferences with industry leaders and to report further progress to Wilson in approximately six months.

Republic gets green light on F-105

The Air Force gave Republic a full go-ahead on production of its supersonic F-105 fighter-bomber but the company also got some bad news: its project to develop the turbine-ramjet XF-103 has been substantially reduced.

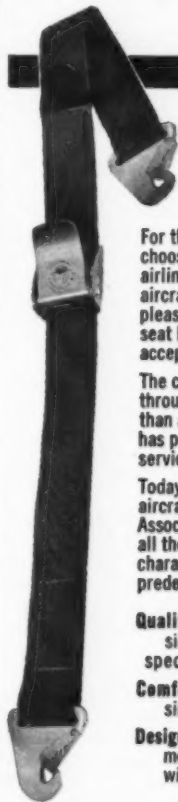
The USAF decision on the F-105 eliminates the North American F-107 as a competitor to the Republic machine and means the Farmingdale company will be in volume production on the aircraft by late in 1958. There will still be a lag of about 18 months between the end of F-84F production scheduled in August and the beginning of volume production of the successor model so the decision will not affect Republic's plans to lay off at least 4,000 workers this spring and the possibility that more will have to be dismissed later on.

The XF-103 was a casualty of the tight squeeze on USAF funds for research and development in the fiscal 1958 budget. Like the North American

Navaho, it has been "re-oriented" along more purely research lines and a number of XF-103 prototypes have been eliminated. It is understood the project will be reviewed again later this year to determine whether it should be continued.

It is understood the aircraft employs a radically advanced Curtiss-Wright powerplant combining a conventional turbojet engine with ramjet propulsion. While such an aircraft would be capable of much greater altitude and speed than conventional turbojet models, there is an increasing tendency in the Air Force to question the value of a fighter aircraft with greater performance capability than that embodied in the current Century series. Except for the need for a new medium-to-long-range interceptor, many Air Force development officials believe that missiles will be able to perform most of the air combat missions of fighters with less cost and greater efficiency.

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Twining, Quarles differ on R&D

Air Force chief of staff fears rising costs will make \$661-Million budget too low

By Lois C. Philmus

WHILE USAF Chief of Staff Nathan Twining is still publicly trying to keep within the Administration party lines for defense of the fiscal 1958 budget request, his uneasiness over specific areas is becoming more apparent.

In one specific area—the restrictive \$661-million research and development request—the uneasiness overflowed into the first open difference of opinion between himself and AF Secretary Quarles.

Quarles assured the Senate Armed Services Committee that the R&D program is as strong as it needs to be “if we are to meet the Communist challenge to our qualitative position.”

The money asked, he maintained, was sufficient to continue technical programming at “approximately the same level.” It provides the funds needed to keep the ballistics missile program on a “highly accelerated basis” and for “normal” increases in the management and operation of the program.

But Twining differed noticeably. Although his official testimony was postponed to a later date, his prepared statement declared: “Rising research costs, stemming from and coupled with mounting complexity, tend to confine our research and development to a narrowing front.”

With the requested funds, he said, Air Force will carry on its current operational requirements but is eliminating or deferring other research and development projects “with potential, future pay-off.”

Although he did not specifically name projects that would have to be candidates for deferment, earlier Pentagon reports have clearly indicated that the Douglas C-132 and its engine, the Pratt & Whitney T57 have “had it,” at a possible cost to the government of about \$70 million.

Further stretchout of the nuclear bomber program was hinted by Committee Chairman Richard Russell (D-Ga.), although it was later learned that over half a billion dollars will have been spent on research through June, 1957, without any radical breakthrough. And Twining himself said the North American air-breathing long-range Navaho missile will have its priority further evaluated later this year.

Twining reported an apparent drive on the part of the Russians to broaden their development front during the past few years. He called attention to intensive Soviet efforts in propulsion and the parallel development

and near-simultaneous production of two “very different” types of intercontinental bombers.

Quarles was optimistic in his remarks on the sufficiency of U.S. airpower; Twining concurred, but with a subtle note of caution. He asserted that the USAF is “still considerably

No Change in Airlift

DESPITE ARMY CHARGES of inadequate airlift from the Air Force, there will be no change in total strength originally planned through fiscal year 1958.

Both AF Secretary Quarles and Chief of Staff Gen. Twining asserted the airlift was adequate. Said Gen. Twining:

“A study by the Joint Chiefs of Staff shows that the wartime capability of the Military Air Transport Service, as forecast for fiscal year 1958, will be generally adequate to meet estimated military airlift requirements when augmented by our heavy troop carrier aircraft and transports of the Civil Reserve Air Fleet . . . Troop carrier units can provide adequate airlift for airborne assault operations.”

stronger than the Soviets” in strategic striking forces. But, pointing to the faster rate of build-up expected from Russia, he warned that “we estimate they could cut our lead appreciably.”

Twining believes the Russians now have the advantage in some areas, with the U.S. keeping it in others.

Most significant change over last year—based on new intelligence of Soviet power—is the reduced estimate of Russian heavy-bomber buildup over the next two years.

This, coupled with accelerated B-52 program, has given the U.S. an unquestioned lead. Even a new finding that the Russian Bear turboprop bomber is even more of a threat than the jet-powered Bison because of its far greater range has not altered the status.

Four new wings of 45 B-52's will be activated during 1958 bringing the total at the end of the year to eight with three B-36 wings left to convert. The production schedule for the 11 B-52 wings calls for 603 aircraft and the fiscal 1958 budget provides for 101, with 502 financed through fiscal 1957.

But in other combat aircraft categories, it's a draw. Twining reported the status as follows:

Medium jet bombers: USAF B-47's continue to outnumber Russian types by a “wide margin” but the lead will diminish as the new Badger is integrated into the Soviet inventory.

Light bombers, fighter bombers and day fighters: Soviets “have held and will continue to hold a very great numerical advantage.” But one reason for the Soviet lead in fighters stems from the “vastly greater” defensive problem facing the Russians.

All-weather interceptors: USAF is well ahead in both quality and quantity.

Transports: U.S. will keep “a big numerical lead” but it should be remembered that the Russians are the only nation operating jet transports.

The Chief of Staff said the Russians are limited in the directions they can fly aircraft to attack the U.S. until they get planes with unlimited range or unless they depend on one-way missions. But, he warned, as soon as the Soviet Union has submarines with missile-launching capability, “we will face a threat that can come from any direction.”

Twining appeared to be satisfied with the procurement program but he seemed to be concerned over the cuts in other areas necessary to achieve it. He described operations and maintenance money as the “absolute minimum” with “no provision for meeting the unforeseen requirements that in the past have always seemed to occur.”

Gen. Twining Reports: USAF and Missiles

BALLISTIC MISSILE PROJECTS, substantially on schedule with nothing further to be done to provide operational missiles appreciably sooner.

NAVAHO, not as far along in development as **Snark**, will have its priority further evaluated later this year.

SNARK will be continued because it may become the first truly intercontinental missile.

BOMARC development is being pushed and once operational will reduce USAF requirement for short-

range manned interceptors now in existence.

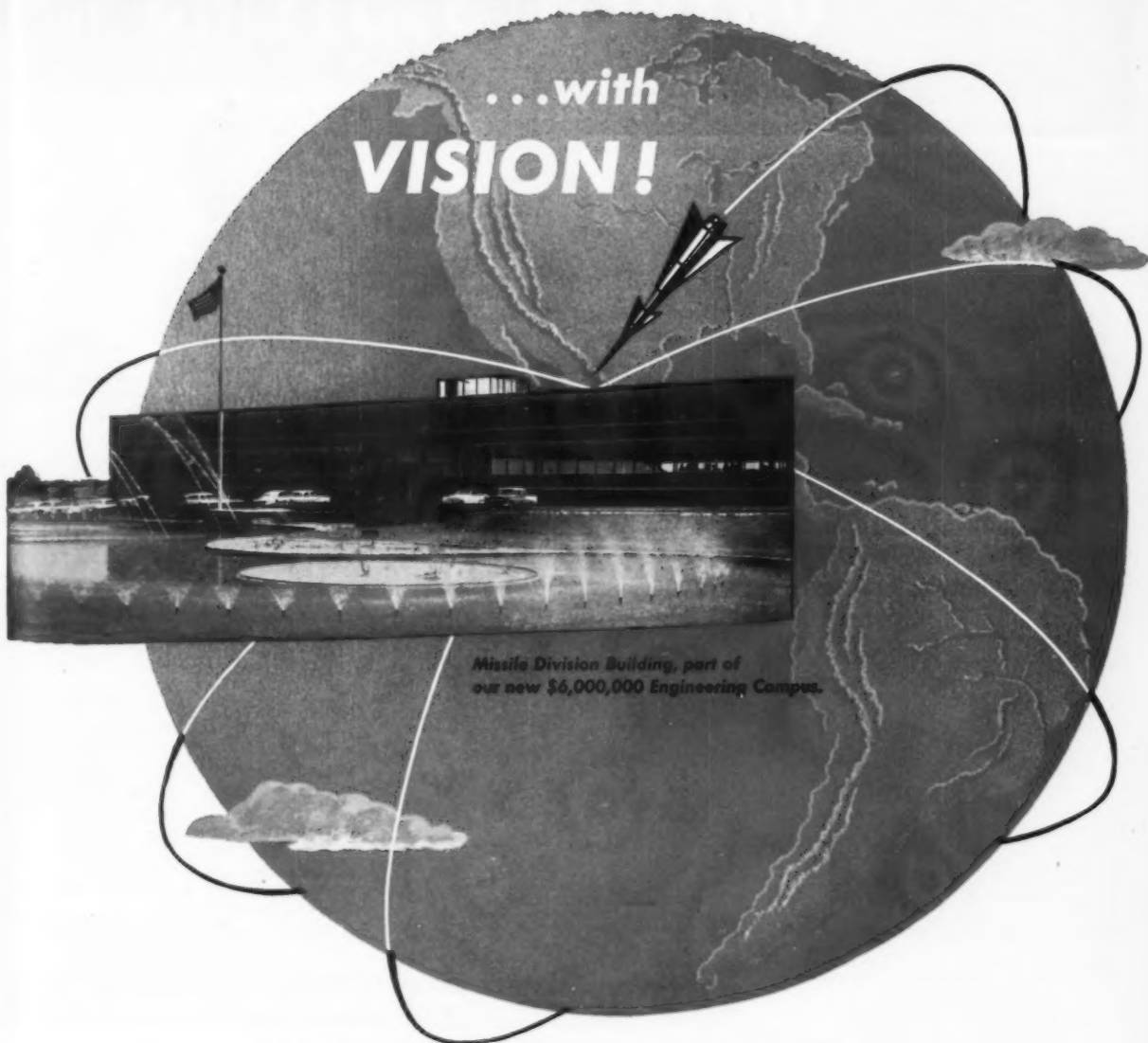
NAVY-DEVELOPED SIDEWINDER will be used on certain day fighters and Falcon is now in operational units.

SAC BASES will be protected either by Talos or Nike Hercules, CONAD to replace the existing Nike Ajax with the new nuclear Hercules.

AF IRBM—Thor—has progressed well, AF says. While Twining mentioned only Jupiter, Wilson told a press conference Jupiter project was out (see story p. 22).

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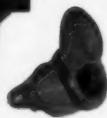
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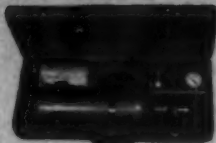


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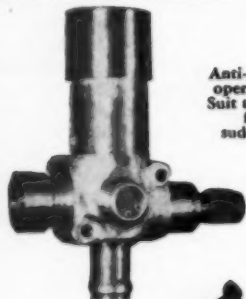
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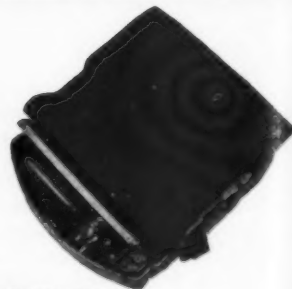


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Congress launches procurement probe

Cincinnati manufacturer testifies AF gave him runaround

By Charles Schaeffer

TOP AIR-FORCE procurement officers last week were stepping fast to parry thrusts by probing Congressmen. As the House Armed Services Investigations Subcommittee launched a study of AF buying policies, both Pentagon and Air Materiel Command brass found themselves on the defensive.

But despite the AF's claim that the situation now favors the taxpayers it was almost certain that Congressmen would move this year to change the rules of negotiated procurement.

Nucleus of the inquiry was the charge by a Cincinnati air-conditioner manufacturer, who insisted he had twice been given a run-around by the Air Force. In sworn testimony Robert G. Adair, president of Keco Industries, Inc., said:

He had lost a \$3-million contract because the Air Force had failed to tell him he was no longer low bidder, after his initial proposal.

A Pentagon official had suggested he drop another procurement complaint involving a \$2-million award.

AF Official Denies Charge

The second charge drew a prompt denial from Max Golden, Deputy Assistant AF Secretary for Procurement and Production, and set off a three-day colloquy.

Golden admitted receiving Adair at the Pentagon last Spring. But, he replied in answer to Adair's complaint, the Ohio contractor was informed his firm was excluded from bidding on a \$2-million contract in question, because negotiation had been narrowed to two firms, capable of starting production faster. The "urgent" need for MA-3 air conditioners (which maintain desired ground temperatures for B-52s) forced the move, Golden said.

He said he never suggested nor intimated that Adair drop his challenge of the award. Three other Pentagon officials at the meeting said they couldn't recall hearing the alleged suggestion, either.

At one point preoccupation with the conflicting statements touched off a heated debate among committee men, who charged the hearings were being sidetracked. Chairman F. Edward Hebert (D-La.) moved quickly to squelch the protest. The "veracity" of the witnesses is paramount, Hebert said. "When one witness calls another a liar we want to know why."

The Louisiana Democrat contended that the Subcommittee's job was to ferret out possible intimidation or threats of recrimination. Pertinence of the testimony would be decided by the Chair, Hebert said.

In its quest for a statement of AF policy, the Subcommittee summoned one of the service's chief procurement officers. Summarizing his view of the Keco company's most recent unsuccessful

bid, however, Brig. Gen. William T. Thurman, Air Materiel Command, backed AF procurement policies across the board.

He disputed Adair's claim that procurement officers neglected to warn him of the changed status of a No. 14 proposal. Although he was not directly involved in the procedures at that time, Gen. Thurman insisted AF records clearly show that Adair was notified. A telegram wired in December and a phone call, Thurman said, both should have warned any "reasonable" businessman to revise his bid downward.

Core of Adair's argument before the Subcommittee was that John Hickey, a civilian buyer for the Air Force, informed him bidders would be notified as soon as they were no longer low. Failure of the Air Force to disclose this data caused Keco to lose a \$3-million contract because the firm had no chance to alter its proposal, Adair contended.

Asked if he thought procurement rules should be changed because of this, Gen. Thurman said no. "I don't think it's necessary that they know they are low bidders," he maintained. The release of such data, as it stands, is permissive—that is, up to the discretion of the military buyer. Retention of the authority is a vital negotiation tool that favors the taxpayer, he added.

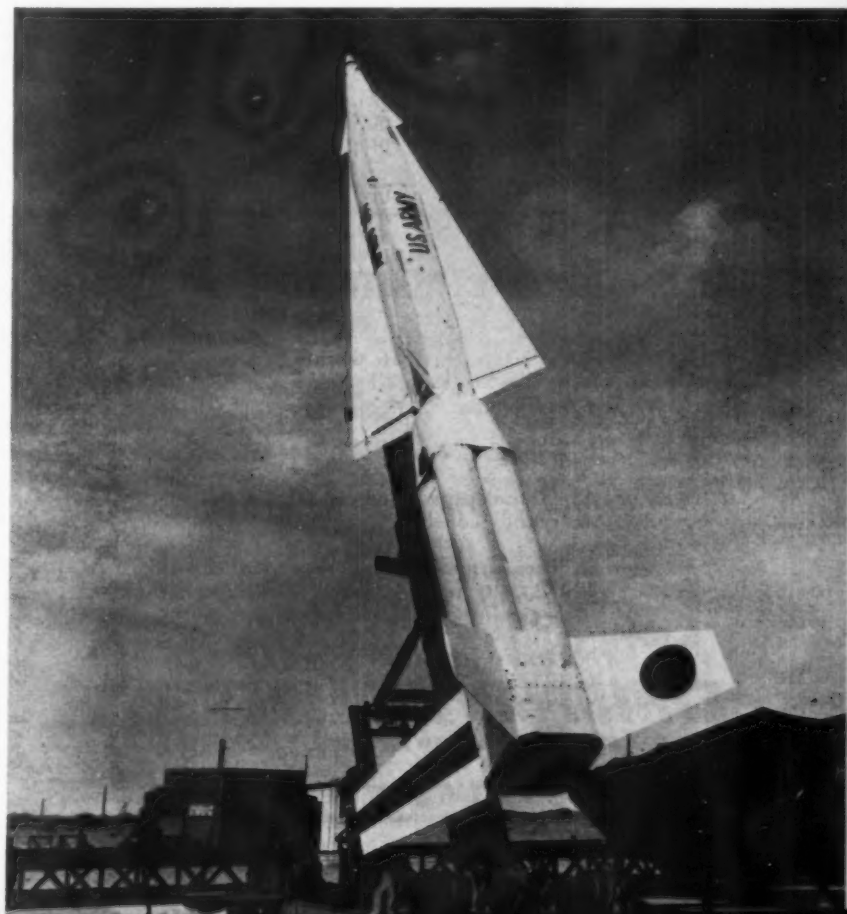
Retaliation Feared

Of the various issues erupting from the hearings, the Subcommittee fretted most over the possibility of subtle AF retaliatory measures against complaining contractors. Repeatedly, probers wondered if a manufacturer appealing to Congress simultaneously cut his own throat.

It only partly satisfied the Subcommittee that Adair himself had subsequently received Air Force business, despite four trips to the Hill.

Longer range Nike nears operational status

ARMY HAS UNVEILED its improved Nike B antiaircraft missile, known formally as Nike Hercules. Western Electric Co. is prime contractor, manufacturing ground guidance and control equipment; Douglas will produce it. New weapon has about three times range of original Nike, 70 mi. compared to 20-25 mi.



Scientists report progress in missiles

As engineers and scientists from the nation's top missiles and rockets makers talked of out-of-this-world flight at Convair Astronautics' Space Flight Symposium in San Diego, they brought science fiction into the laboratories and onto the drawing boards.

However, they also dropped hints that indicated real progress was being made in making earth-bound missiles the super-weapons they're reported to be.

Drs. George Solomon of Ramo-Wooldridge Corp. and Joseph Charyk of Astronautics Systems, Inc., noted that the sometimes vastly different atmospheres on other planets might not treat our own aerodynamic theory too kindly. Dr. Gabriel Giannini reported on recent experiments with highly ionized gas jets with greater energy than can be achieved chemically.

Plasma jets utilizing gases containing a high percentage of ionized particles and electrons have been operated in Giannini Research Laboratory producing temperatures of 10,000°K and power in excess of 50 kilowatts per square millimeter of nozzle area on a continuous basis. This temperature is the highest ever achieved on a continuous basis and exceeds by about 35% that of the surface of the sun.

For the moment at least, this jet will probably be used as a research tool, for simulating ballistic nose-cone re-entry conditions in hyperthermantic windtunnels.

The stream of the plasma jet is accelerated both chemically and electrically by means of magnetic fields. Control of the jet's composition will permit researchers to duplicate condi-

tions from sea-level to near-space by varying the gas density and concentration of charged constituents.

Discussion of propulsion systems, "present and future," revealed agreement by the participants that (a) the use of free radical fuels appears promising and (b) research effort being applied to its achievement is adequate.

Considerable interest in ion and photon rockets was reported. The ion rocket appears to be the more practical approach at the moment, though little more than paper work has been done on either concept. Neither would seem to have any direct application to atmospheric flight.

Dr. Fred Riddell of Avco Research Laboratory suggested that, using proper design precautions, the Vanguard earth satellite might survive re-entry intact. If this were true, it would make a big difference to scientists participating in the International Geophysical Year. They would like nothing better than to bring back samples of "space dust" and other particles for study in the laboratory.

The discussions on re-entry also reconfirmed the fact that transpiration cooling as a way around the problems of hypersonic flight by both aircraft and missiles is still far from dead. Cooling of a hypersonic surface in laminar flow by this method materially delays the onset of turbulent flow in the boundary layer and subsequent multiplication of the heating problem.

Lockheed lists first cost figures on 3 military planes

First specific figures on the cost of the T-33 jet trainer, C-130 turboprop transport and P2V-7 patrol

bomber were disclosed in an extensive employee information pamphlet issued by Lockheed Aircraft Corp.

The T-33 costs the military \$117,000, the C-130 \$2 million and the P2V-7 \$1,102,000.

Lockheed realizes profits of \$3,400, \$50,500 and \$25,000 from each of the three airplanes. More than half the profits are distributed to stockholders in the form of dividends and the remainder is retained by Lockheed for plant improvements, new buildings and equipment, new model development and other things needed to stay in business.

Of these amounts, as much as 84 cents of each dollar goes to Lockheed subcontractors and suppliers. A breakdown of the cost of each aircraft reveals that 84% of the T-33 price goes to subcontractors, 70% of the C-130 figure and 81% of the P2V-7 cost.

Of the T-33 money passing through Lockheed's hands \$98,000 goes to other manufacturers and suppliers or to pay taxes. Some \$1,389,000 of the \$2-million price tag on the transport goes to other companies or federal taxes and \$896,000 of the total P2V cost goes outside Lockheed.

Here's how Lockheed breaks down spending per unit on the three planes:

Outside Spending	T-33	C-130	P-2V
Total	\$98,000	\$1,389,500	\$896,000
Govt. GFE spending	40,000	625,000	500,000
To material, parts suppliers	26,000	345,000	161,500
To subcontractors	24,200	250,000	164,500
Utility bills, insurance, local taxes, etc.	4,200	115,000	43,000
Federal income taxes	3,600	54,500	27,000
Within Lockheed			
Total	\$19,000	\$610,500	\$206,000
Payroll	15,600	560,000	181,000
Dividends to stockholders	1,200	18,500	9,000
Earnings*	2,200	32,000	16,000

Lockheed's programs cover some 11,000 suppliers and subcontractors in 45 states. About 40% of each aircraft's major parts are produced by other companies and shipped to the Burbank, Palmdale or Marietta plants for assembly.

The California Division of Lockheed lists activity with small businesses from none, in the case of engines, where there are no small suppliers, to 98% for outside production purchases. In number, the majority of suppliers are listed as small businesses with less than 500 employees. Dollarwise, about a third of the Lockheed spending is done directly with small businesses and of the 66 cents of every dollar spent with larger concerns, about 20 cents eventually is passed on to small firms.

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Equator and from sea level to extreme altitudes.

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Typical "brain center" of a Holley aircraft engine control. Note the delicate machined surfaces. Each plays a vital role in mechanically regulating the engine under varying conditions.

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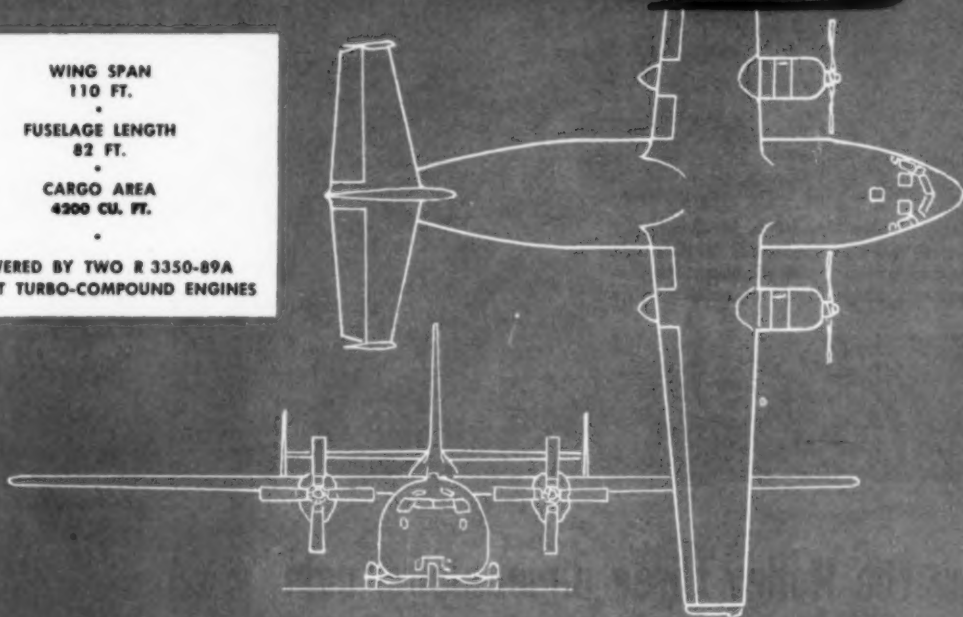
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BDM control system developed by Cornell

REARWARD LAUNCHING of a bomber defense missile (BDM) is possible through use of a control system developed by Cornell Aeronautical Laboratory. Radical system has been tested on an experimental adaptation of the Raytheon Hawk by firing from test sleds at Holloman Air Force Base, N. M. CAL's concepts were turned over to industry for further development. Westinghouse, General Electric and McConnell Aircraft are reportedly working on BDM projects.

NAA to fight ruling on profits refund

North American Aviation will contest in the U.S. Tax Court the ruling of the Los Angeles regional office of the Renegotiation Board requiring the company to refund \$1.3 million of its 1953 profits. The ruling was upheld by the Renegotiation Board itself.

The plan was disclosed at a meeting of the NAA stockholders by Chairman J. H. Kindelberger. In its report, the company said the Los Angeles office had found tentatively that \$6 million of NAA profits in 1953 were "excessive" and that it would have to refund \$1.3 million to the government (allowing credit for federal and state taxes already paid).

Looking ahead, Kindelberger reported: 1957 sales probably will exceed the record \$914 million of 1956 but that 1958 sales will be less and layoffs can be expected late this year; NAA

has kept its long range interceptor project active and now hopes to get some business; NAA is delighted with progress of the F-107 but the project has a "very strong competitor;" Navaho intercontinental missile holds great promise but the company has no orders for the bigger, faster production model; Rocketdyne and Autonetics Divisions can be expected to produce more profits.

Directors declared a regular quarterly dividend of 40 cents a share payable April 8 to stockholders of record March 15.

Fred Weik to direct Piper development

Fred E. Weik has been named director of the Piper Aircraft Development Center soon to be established at Vero Beach, Fla., effective April 1.

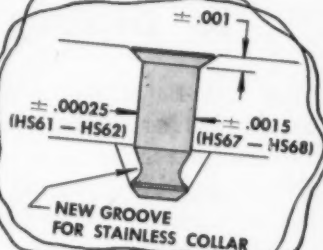
Weik is a widely known aeronautical engineer and lightplane designer (the Ercoupe). He will be in charge of a separate group concen-

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—gives details on Barco swivel joints and their application to many types of flexible assemblies.

SPECIAL DESIGNS



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trating on new model development. He is former vice president and chief engineer of Engineering Research Corp., Riverdale, Md., and for the past nine years has been head of the Aircraft Research Center at Texas A&M College.

His activity at Texas involved development of agricultural aircraft and research for the National Advisory committee for Aeronautics on controls near the stall.

Court rules additive to Shell gas patentable

Shell oil Co. is entitled to a patent for Shell gasoline with TCP additive, according to a decision by Judge Alexander Holtzoff of the U.S. District Court for the District of Columbia.

Judge Holtzoff said that a TCP additive "substantially reduced the fouling of spark plugs and helped cure some of the difficulties especially in connection with airplane engines.

"There would seem to be no doubt that the inventors in this case made an important discovery, namely, the ability to eliminate or at least substantially reduce the fouling of spark plugs by the addition of the chemicals to gasoline fuels containing lead compounds."

The decision said that gasoline with TCP additive received "widespread acceptance" by the Air Force, by other corporations and in other countries. Shell said 10 billion gallons have been sold in the U.S. and many billions in other countries.

AF tries out new plan for plane modifications

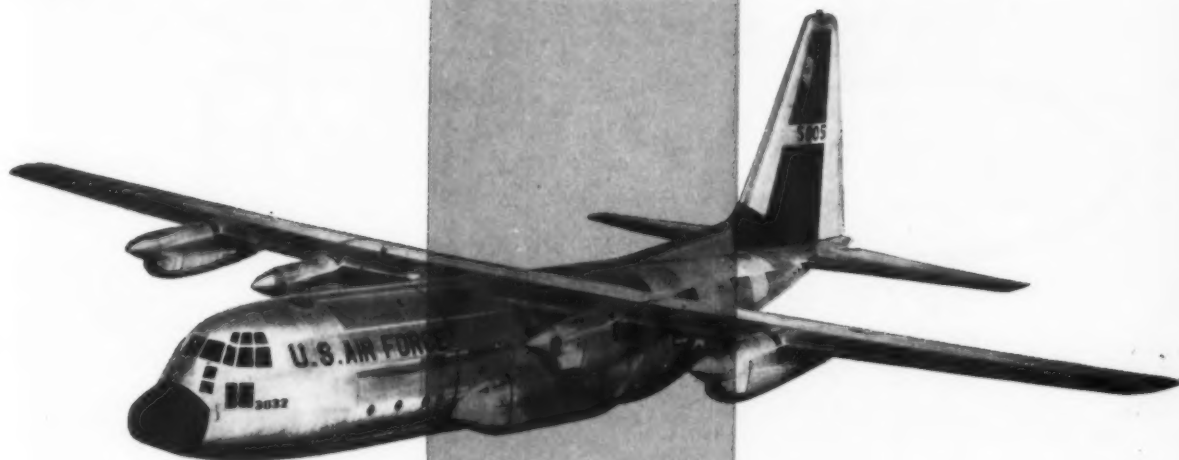
A plan to reduce the time for in-service modifications to Air Force planes is being tried for a year by the Air Materiel Command. It provides for deficiency reports to be handled directly from air bases to Air Force Plant representatives, eliminating the channel through Air Research Development Centers and contractors.

Plant representatives and company engineers will have the authority to make immediate decisions and develop changes. ARDC will make an "after-the-fact" review.

Air Materiel areas and AMC's maintenance engineering director will direct the new plan and AMC engineers will form Support Engineering Divisions under the supervision of the plant representatives.

First to be affected by the new plan will be programs at Convair, Boeing, Lockheed, North American, Douglas, Vertol and General Electric. AMC expects modification time to be cut in half at first, with more savings later. Reduction is expected in number of aircraft out of commission, costs of retrofit and extension of IRAN intervals.

for TAC's new C-130 Hercules...



Flight Control System—by Sperry

A "quick-change artist" has joined the Tactical Air Command's global airlift team. It's the Lockheed C-130 Hercules, capable of performing a variety of missions in keeping with TAC's requirement for high versatility and mobility. The C-130 can carry up to 20 tons of cargo on long-distance flights or can paradrop a load of 27,000 pounds into a combat zone. It can be used as a combat transport to carry 92 airborne troops or can deliver paratroops to a combat zone. It can also be used as a flying hospital.

Since the C-130 works at different altitudes for its various missions—from cargo-drop level to over 35,000 feet—its flight control system must provide precise, automatic control over a wide range of flight conditions. More than equal to the job is Sperry's E-4 system which—for the first time in an Air Force plane—is linked to a Sperry Radio Beam Coupler.

This Sperry team of automatic pilot and Radio Beam Coupler saves time and fuel

by maintaining straighter, more accurate courses. More precise approaches mean greater efficiency and speed in carrying out vital USAF missions. And pilot fatigue is substantially reduced.

Asking Sperry to design, engineer and build advanced flight control systems for today's advanced jet and propjet aircraft follows long-established practice. Thousands of Sperry systems are providing safe, efficient automatic flight control for all types of aircraft—from intercontinental jet bombers to private planes. If you have a flight control problem, Sperry engineers can help you find the answer. Write our Aeronautical Equipment Division.



GEORGE JUDE, Director, Flight Control Engineering of our Aeronautical Equipment Division. Serving aviation at Sperry for 15 years, he won the 1956 Lawrence B. Sperry Award "for significant contribution to the advancement of precision automatic flight control and safe all-weather flight."

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MARCH 11, 1957

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Robinson Quality for \$15.50

Here is the answer to your demand for a mass produced wire-twister. It's the all new JET M84 Robinson Wire Twister. The JET is a worthy partner to the standard Robinson model that has cut engine wiring time 66% for virtually every major aircraft company in the free world.

Robinson quality? Certainly. You'll find it in the specially rehardened jaws and cutters, in the optional Grip-Lok or Sleeve lock, in the swift, smooth (and patented) action, in the heat treated, drop forged, alloy steel pliers with black finish.

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This fast, powerful addition to the Bell fleet defies severe weather and rugged terrain. In a matter of minutes its luxurious executive interior can be converted to cargo carrier, aerial ambulance or rescue conveyance ...its internal hoist can be completely installed in five short minutes.

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QUICK-CHANGE FLOAT INSTALLATION



TWO-PATIENT LITTER-KIT INSTALLATION



FT. WORTH, TEXAS
Subsidiary of Bell Aircraft Corp.

Chance Vought's Crusader

was engineered for production from the start even before the prototype was built. First production models of the supersonic carrier fighter are slated to join fleet squadrons this month, 26 months after first flight of an F8U-1

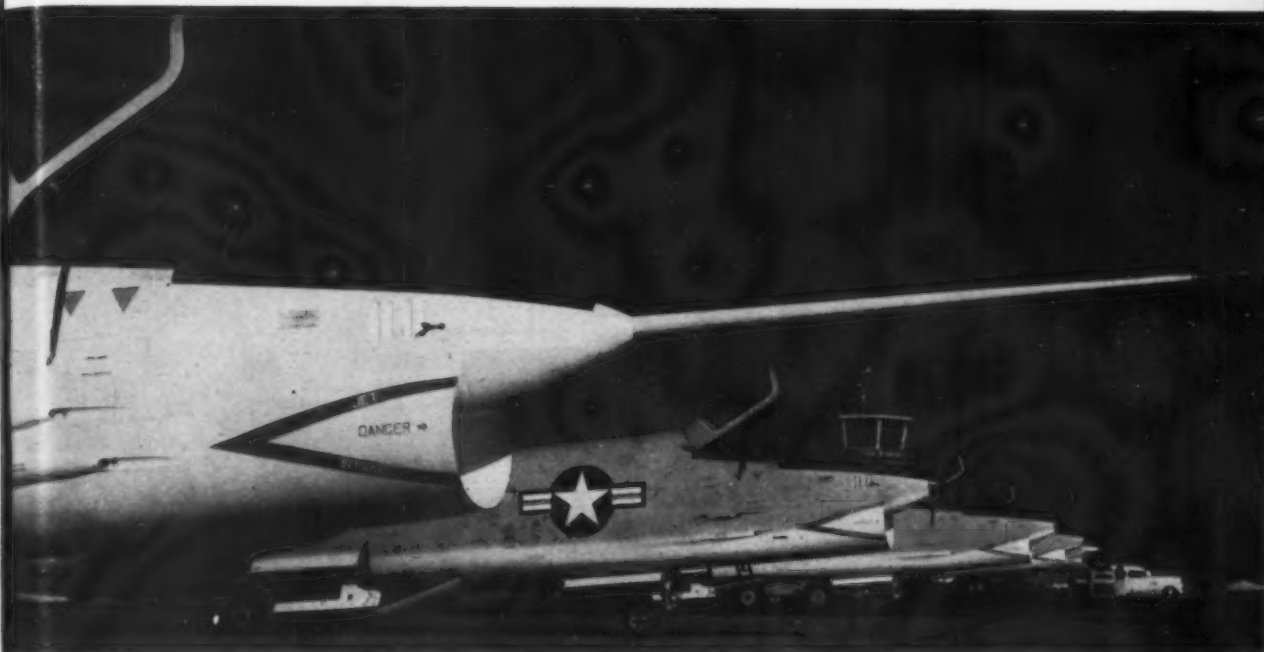
USE OF TITANIUM in F8U's aft section allows the aircraft to stand the exhaust heat of the J57 engine. About 650 pounds of titanium or titanium alloy are used throughout the Crusader. Most is in the aft section but some appears elsewhere in the aircraft (rocket pack, for example) in the form of high-strength lightweight fasteners.

EXAMPLE OF PACKAGE system concept in design is the horizontal tail power control unit which includes power cylinder, valves and feedback mechanism. After panel is removed, less than a dozen bolts and hydraulic connections need to be disconnected for removal of unit. Bench-tested package can then be installed.



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8U-1

is the
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FINAL ASSEMBLY line appears to move in reverse. Crusaders are angled to conserve space. Rocket pack and ejection seat (on floor) will be installed at this position.

FINAL ASSEMBLY completed, the big Navy fighter is lifted from its fixture prior to check-out and delivery to the flight line. Above completed F8Us on the flight line.



CAPABILITIES . . . Manpower, Tools and Experience



BEECH BUILDS	
	MA-3 MULTI-PURPOSE VEHICLES
	C-26, MD-3 POWER UNITS
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	BEECHCRAFT T-34 TRAINERS
	BEECHCRAFT L-23 TRANSPORTS
	4-PLACE BEECHCRAFT BONANZA
	6-PLACE BEECHCRAFT TWIN-BONANZA
	8-PLACE BEECHCRAFT SUPER 18

No other ground support unit offers the complete flexibility and "fast starting" action of the Beechcraft MA-3 Multi-Purpose Vehicle, now entering service with the U. S. Air Force.

The MA-3 has 12,500 pounds draw-bar pull for towing aircraft, which can be increased by adding to its gross weight. It has reciprocating and gas turbine power plants, an air cycle type air-conditioner of 13-ton capacity, high pressure air compressor with capacity of 15 CFM of free air at pressures up to 3500 PSI. The vehicle can travel at 45 mph, maneuvers easily, has four-wheel power steering, four-wheel drive and four-speed torque converter transmission (four speeds forward and two reverse).

The MA-3 provides 28 Kilowatts direct current from two self-cooled 500 ampere 28-volt generators; features split and single bus; has three-phase alternating current 60 KVA-45 KW; and a self-cooled alternator, precisely controlled frequency 400 CPS.

Unexcelled in-the-field service by thousands of Beechcraft ground power units and a world-wide service organization add to the advantages of this truly exceptional unit.

Inquiries from airlines, manufacturers, and others who desire details of the most advanced and modern ground support unit will be welcomed by the Contract Administration Division, Beech Aircraft Corporation, Wichita 1, Kansas.

Beechcraft

BEECH AIRCRAFT CORPORATION, WICHITA, KANSAS, U. S. A.

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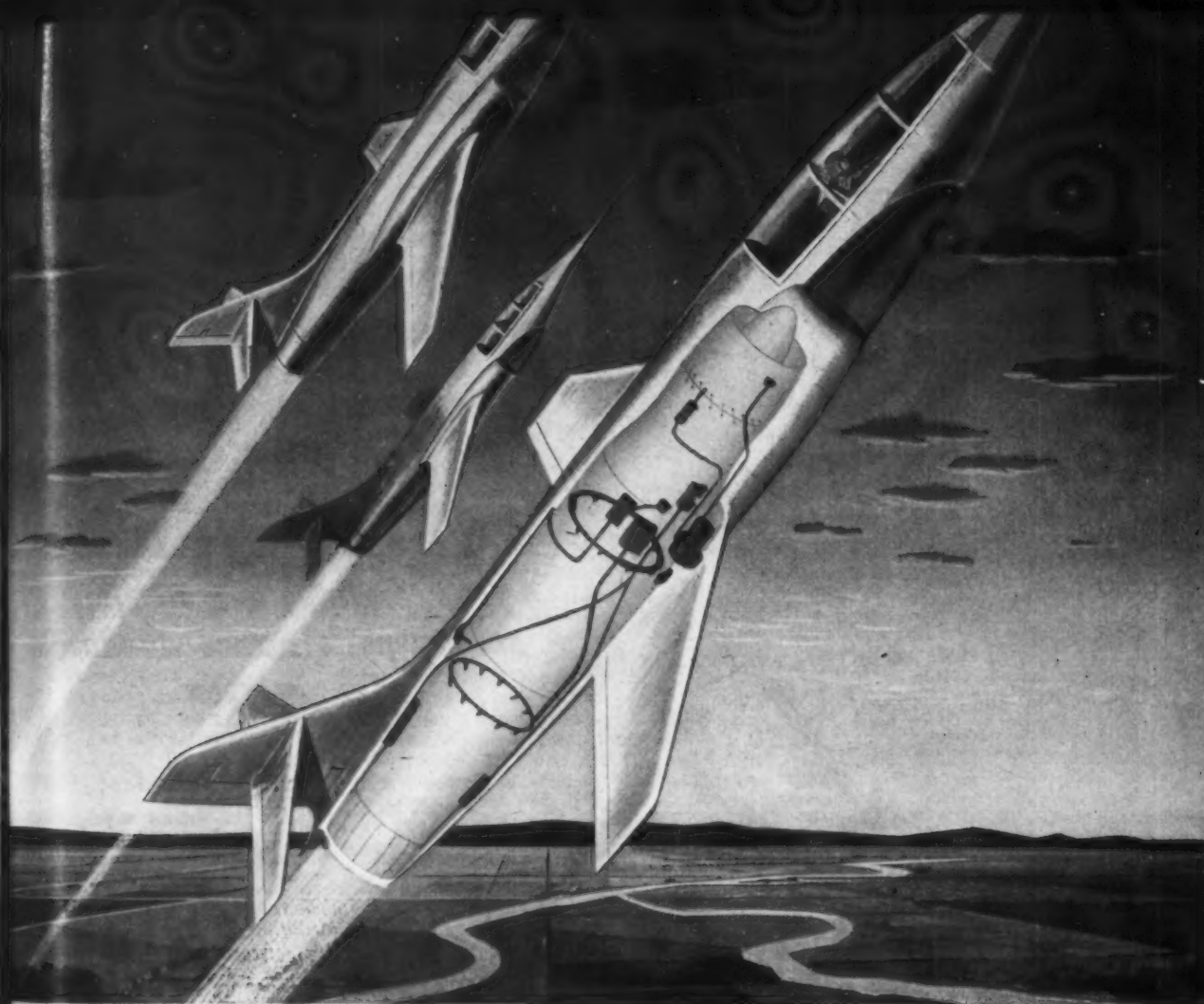
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AVIATION



TOWARD MACH 3

WITH A COMPLETE BENDIX SYSTEM FOR FUEL METERING AND ENGINE CONTROL

When the pilot swings the lever from idle to emergency thrust—or back again—things must happen fast in the big jets.

But not too fast! For, pouring it on, or cutting back faster than the engine can take it, spells disaster. The penalties are ruinous over-temperatures, compressor stall or flame-out.

When the pilot orders a change in thrust, the Bendix* fuel metering and engine control system takes over. Fuel

feed is automatically computed and scheduled. Geometric controls such as exhaust nozzle area and inlet vane angles are set. Automatically and instantly, engine response is crowded to the limit—but not beyond!

Matched sets of Bendix components—pressure and temperature sensors, electronic amplifiers, fuel metering units and engine control actuators—work together as a *system*, spanning the length and girth of the engine.

Bendix components, designed and

engineered together, invariably give more efficient performance than any arbitrarily assembled system.

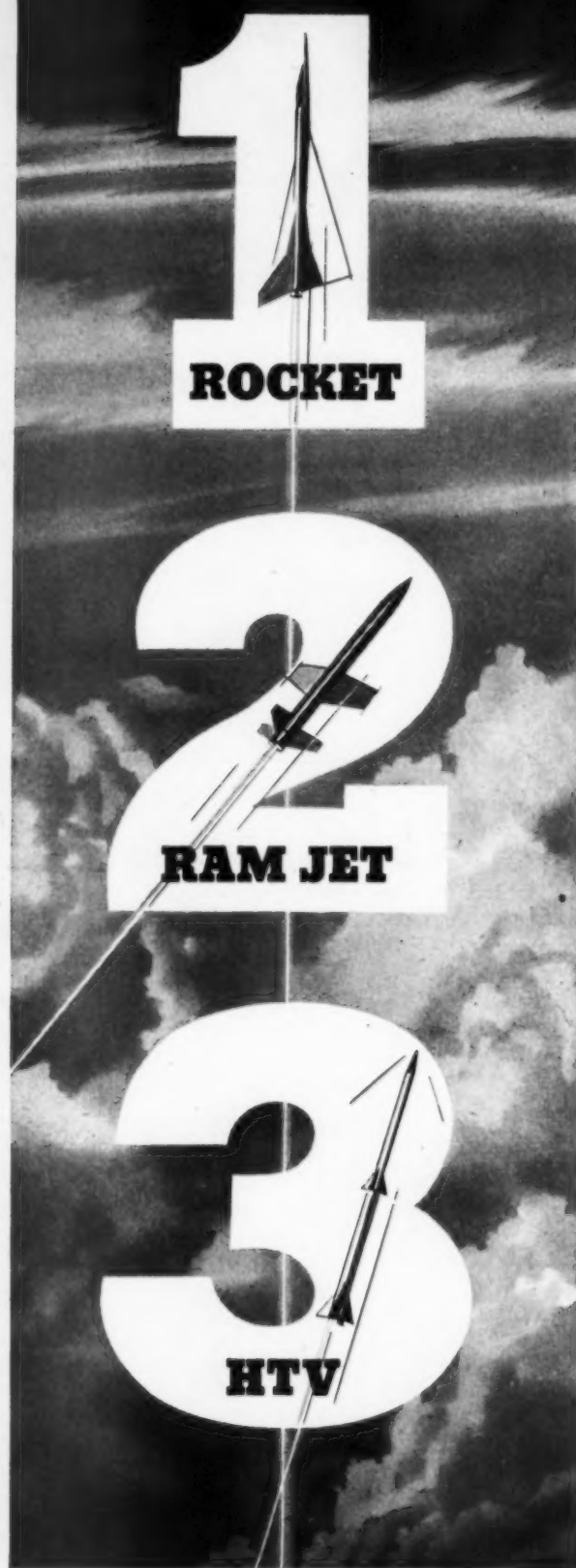
And there is the further important advantage of having one source and having that source completely responsible for over-all dependable operation on the plane.

So, when it comes to fuel metering and engine controls, think of a complete and integrated system. Then we suggest you think of Bendix and the Bendix Products Division.

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CURTISS-WRIGHT

*powerplants and missiles
set new performance standards
for tomorrow*

A Curtiss-Wright Rocket Engine recently powered an aircraft higher and faster than man has ever flown before. A Curtiss-Wright supersonic Ram Jet Engine was the first controlled supersonic ram jet to be successfully flown — and advanced versions are now being developed for piloted aircraft and guided missiles. A Curtiss-Wright hypersonic test vehicle — the HTV Rocket — recently reached supersonic speed in a fraction of a second . . . developed several times the speed of sound in just two seconds.

These developments—all capable of several times the speed of sound — are the advanced guard in America's defense, and in America's research toward the high speed, high altitude air travel of tomorrow. They are dynamic evidence of Curtiss-Wright's leadership in the aviation industry — setting the pace for aviation's progress in every category of air power.



World's Finest Aircraft Engines

R for future flying: fewer human factors

Air Force research aims to reduce pilot decision-making in high-speed flight

by William Beller

Taps are being blown for the rudder-and-stick control of future high-speed aircraft. Dr. James Skeen, head of the human factors research unit of the Martin Co., Baltimore, says that the demise will probably come with Mach 2 and Mach 3 aircraft.

He feels that pilots are having trouble enough trying to hold on to Mach 1 planes. When higher Mach planes are operational, pilots will have an impossible control job unless the rudder and stick are replaced by automatic equipment.

Skeen points out that with cockpits becoming more and more crowded with equipment enabling planes to fly higher and faster, the rudder and stick will become too much of a luxury to maintain.

Pilot Needs Relief

The pilot is a decision-maker and should spend most of his time in this activity. For example, an interceptor pilot should be deciding whether his kill position is optimum or whether a second pass at his target is warranted. He should be relieved of the mechanical details concerned with navigating, attitude control and plant administering.

These are jobs for the autopilot, whose decision-making capabilities in its field can be made far superior to that of the pilot.

One of the chief factors holding back development of Mach 2 and Mach 3 aircraft is sufficiently reliable autopilot equipment. But based on the advances that the industry has already made, Skeen sees in ten years automatic controls coloring the entire spectrum of aircraft flight including take-offs and landings. At that time, he said, "Flight controls will be part of the cockpit display panel and will act as inputs to the system."

Skeen's observations stem from the increasing emphasis that the military and industry are placing on the man-plus-machine or human factors problems. The Air Force first recognized the field in 1948 by forming a Psychology Branch of the Aero Medical Laboratory at Wright Air Development Center.

Since that time, four other human factors installations have been made, located at Cambridge Research Center, Hanscom Field; Personnel and Train-

ing Research Center, Lackland Air Force Base; Special Weapons Center, Kirtland AFB; and at Flight Test Center, Edwards AFB.

Three more Air Force centers are being studied with a view towards installing human factors laboratories. This would leave only three of the ten major Air Force R&D centers without human factors laboratories.

All human factors research and development work is monitored for the Air Force by the Human Factors division of the Directorate of Research and Development. With only few exceptions, Air Research and Development Command controls contract awards and project assignments. Currently, Air Force commands are working on 140 human factors projects, comprising 900 individual tasks.

Human factors considerations are becoming increasingly important in ARDC's evaluation of contract proposals. The Command wants to be assured that human beings will be able to use proposed equipment, and that they will be protected while using it.

Recently, the Air Force began im-

plementing a program for forecasting the personnel and training requirements imposed by the development of new weapons and supporting systems.

The forecasts, termed "Qualitative Personnel Requirements Information" (QPRI) were developed by the Human Factors division of ARDC. They were designed to assure Air Force of the availability of trained personnel in phase with the development of new weapon systems.

QPRI's will also support research and development testing of new weapon systems.

The first test of the program on a major weapons system will be with the nuclear-powered bomber program. Subsystems of other programs will in some cases be evaluated retroactively. This

program includes ground-based as well as airborne systems and components.

Feedback from the program will result in manufacturers' being asked to furnish QPRI exhibits with their proposals for contracts. ARDC says these exhibits could easily be the determining factor in contract awards. Realizing this fact, some companies have established human factors departments, which monitor design proposals from the users' standpoint. Companies with such departments already organized include Boeing, Convair, Crosley, Douglas, Hughes, Martin and Radioplane.

A typical human factors department is currently being expanded at the Martin Co., Baltimore, which holds a one-year Wright Air Development Command contract to investigate the "Human Requirements for Displaying Flight Data." The department comprises five units: Project Support, Human Engineering, Aero Medical, Human Factors Research, and Crew Station Integration. What they do:

Project Support Unit. Each production and advance design project is assigned a human factors team con-

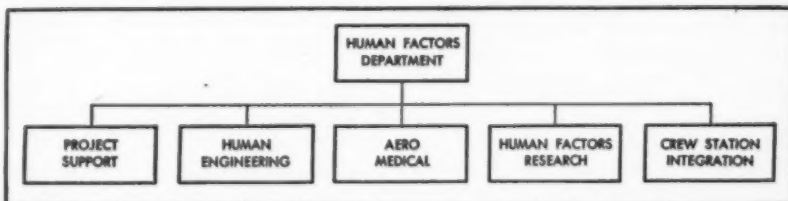


Table of organization for Martin Co's human factors department.

sisting of human engineering and aero medical advisers. These teams analyze their projects and write human factors reports, which tell the designers the human factors problem areas and the design criteria to be used.

In particular, the teams (1) analyze weapon systems to determine operator and crew requirements; (2) determine whether task requirements are within the abilities of operating personnel; (3) formulate training and training aid requirements; (4) establish display-and-control design criteria; (5) detail aero medical aspects; (6) specify styling and comfort requirements.

The Project Support Unit acts primarily as a liaison unit between the design engineers and the human factors

design engineers and the human factors

design engineers and the human factors

design engineers and the human factors

ENGINEERING

department. This unit draws upon the other four units of the human factors department for data and advice.

Human Engineering Unit. The basic mission profile of a weapon system is studied from the standpoint of the personnel operating the system. Crew requirements are established for optimum weapon efficiency. Detailed tasks are outlined for each crew member and also for the integrated crew team. From these analyses, the display and control requirements are established together with training and training aid requirements.

Aero Medical Unit. The biological effects of cosmic, solar, nuclear and other radiations are studied with a view towards providing personnel protection from these hazards. Information is given about how well human beings can endure accelerations and vibrations. The special senses of humans are measured, and the capabilities and limitations of personnel are established. Problems arising from crew station environment are studied.

Human Factors Research Unit. Research in physiology (aero medicine) and psychology are prime responsibilities. The research unit comprises groups in planning facilities and experimental equipment, evaluation and special projects.

In physiology, the unit conducts fundamental studies to determine human capabilities under the environmental stress of operating modern weapon systems. In psychology, the unit investigates the response characteristics of human operators of modern weapon systems as a function of task, equipment, training variables and operator characteristics.

Crew Station Integration Unit. The engineering feasibility of human factors criteria are examined. The unit prepares for evaluation scale mock-ups of proposed crew stations. Tentative crew-station-arrangement criteria are prepared.

For human factors' work, advantage is taken of every research facility and personnel specialty available. For example, Martin's plans include developing full-scale simulators into which the characteristics of any aircraft or missile may be fed. Analyzing the personnel undergoing simulator test will be psychologists, physiologists and engineers.

System needs will arise as the human factors' field, which is only 10 years old, is cultivated further. One anticipated need is for an automatic G-sensing device, which will limit an airplane's maneuvers to safe G-factors.

Human factors' work is expected to result in the development of more efficient weapons systems, in decreased training time of systems operators and in increased safety of aircraft.

Active air force human factors research

PROJECTS

RESPONSIBLE AGENCY

Human Engineering

Auditory Presentation of Information	AFCRC
Communication in Noise	AFCRC
Ground Communication Field Studies	AFCRC
Human Engineering Analysis Weapon Systems	WADC
Human Engineering Maintenance Efficiency	RADC
Human Engineering of Controls	WADC
In-Flight Human Engineering Studies	WADC
Information Processing by Human Operator	AFCRC
Visual Presentation of Information	WADC

Trainers and Simulators

Aerial Targets Scoring Device	WADC
Airborne Target Simulator	WADC
Bomb Scoring Equipment	RADC
Bomb Scoring Techniques	RADC
Ground Radar Techniques	WADC
Gunnery Trainers	WADC
Instrument Flight Trainers	WADC
Navigation Trainers	WADC
Observer Flight Simulator Trainer	WADC
Radar Collision Course Tow	WADC
Radar Target Study Device	WADC
Tow Targets and Equipment	WADC
Visual Flight Simulator	WADC

Protection Clothing and Equipment

Aircraft Liquid Oxygen Equipment	WADC
Aircraft Oxygen Systems Development	WADC
Arctic Human Engineering	Arctic AeroMed
Arctic Personnel Equipment Requirements	Arctic AeroMed
High Altitude Pressure Suits and Accessories	WADC
Oxygen Dispensing Assemblies	WADC
Oxygen Generation Research	WADC
Personal Equipment Integration	WADC
Personnel Restraining Devices	WADC
Visual Aids and Protective Equipment	WADC

Aviation Medicine

Altitude Chamber Equipment Design	SAM
Biodynamics Human Factors in Aeronautics	HADC
Biophysics of Escape	WADC
High-Altitude Physiology	WADC
Human Factors of Space Flight	HADC
Human Thermal Tolerance	WADC
In-Flight Visual Efficiency	WADC
Physiology of Acceleration	WADC
Techniques for Care of Flyers in Arctic	Arctic AeroMed

Medicine and Allied Sciences

Arctic Survival	Arctic AeroMed
Cold Acclimatization	Arctic AeroMed
Human Response to Vibration and Noise	WADC
Materials Health Hazards	WADC
Perceptual Problems of Flight	SAM

Personnel Utilization

Aeromedical Training	SAM
All Weather Pilots	AFPTRC
Crew Training and Proficiency	AFPTRC
Maintenance and Servicing Testing	AFPTRC
Manpower Research	AFPTRC
Motor Skills	AFPTRC
Observer Training and Proficiency	AFPTRC
Perceptual Skills	AFPTRC
Selection and Classification Research	AFPTRC
Strategic Pilot Training	AFPTRC
Survival Research	AFPTRC
Unit Motivation and Effectiveness	AFPTRC

Explanation of Abbreviations:

AFCRC, Air Force Cambridge Research Center, L. C. Hanscom Field, Bedford, Mass.
AFPTRC, Air Force Personnel and Training Research Center, Lackland AFB, Texas
Arctic AeroMed, Air Research and Development Command, Baltimore, Md.
HADC, Holloman Air Development Center, Alamogordo, New Mexico
RADC, Rome Air Development Center, Griffiss AFB, Rome, N. Y.
SAM, School of Aviation Medicine, Randolph Field, Texas
WADC, Wright Air Development Center, Wright-Patterson AFB, Ohio

THE "EYE"

that sees in the dark is

INFRARED

Hayes Aircraft Corporation has a competent staff of infrared scientists and engineers which is conducting research and development programs calculated to advance the frontiers of infrared physics. Much of this work of course is classified, and Hayes respects the needs of national security.

However, if you have an unusual technical problem which might lend itself to a solution utilizing the tools and techniques of infrared physics, we invite you to present your problem to the Hayes infrared radiation staff for consideration and analysis.

Hayes is a fully competitive company, employing more than 8,000 people. Without a doubt, it is the fastest growing aircraft company in the United States.

TO SCIENTISTS AND ENGINEERS

Infrared physics is but one of the sciences presently being explored by the Hayes scientific staff. There are many challenging positions open here to personnel qualified in the fields of infrared physics, spectroscopic analysis, physical chemistry, kinetic molecular theory, semi-conductor research and development, thermodynamics, fluid dynamics, and kinematics, to name a few. Mail a resume of your training and experience to Director of Personnel.



ENGINEERS • DESIGNERS • MANUFACTURERS



How to cool a pilot in the Thermal



*The Douglas X-3,
used in heat
dispersion studies.*

With aircraft that top 1000 mph now in military service, the problem of *heat dispersion* gets growing attention from Douglas engineers.

Once called the heat barrier, science now uses a more accurate term, *thermal thicket*. The faster you fly through the earth's atmospheric blanket, the further into the thicket you get . . .

At Mach 2, twice the speed of sound, a plane's skin temperature can reach 275°F. At Mach 3 it leaps to 650°F, and at Mach 5 hardened steel wilts like lettuce . . .

Douglas is attacking this heat problem on many fronts. Air conditioners powerful enough to cool a theater were tested in the famous X-3 research plane seen at left. In current Douglas missiles, amazing advancements are being made in the design of heat-resisting materials and structures. This knowledge will speed the solution of the thermal thicket problem for piloted aircraft.

Thicket

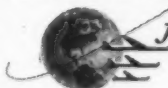


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The Douglas Aero-rotor, an instrument that blasts out high velocity gas at temperatures upward of 3000 degrees Fahrenheit, helps in research for materials to withstand high temperatures and jet velocity erosion. Other work now on the boards at Douglas ranges from designs for the practical application of atomic power to the complete design and building of inter-continental missiles — and even includes the engineering for a space platform first considered as early as 1946.

Depend on
DOUGLAS
first in Aviation

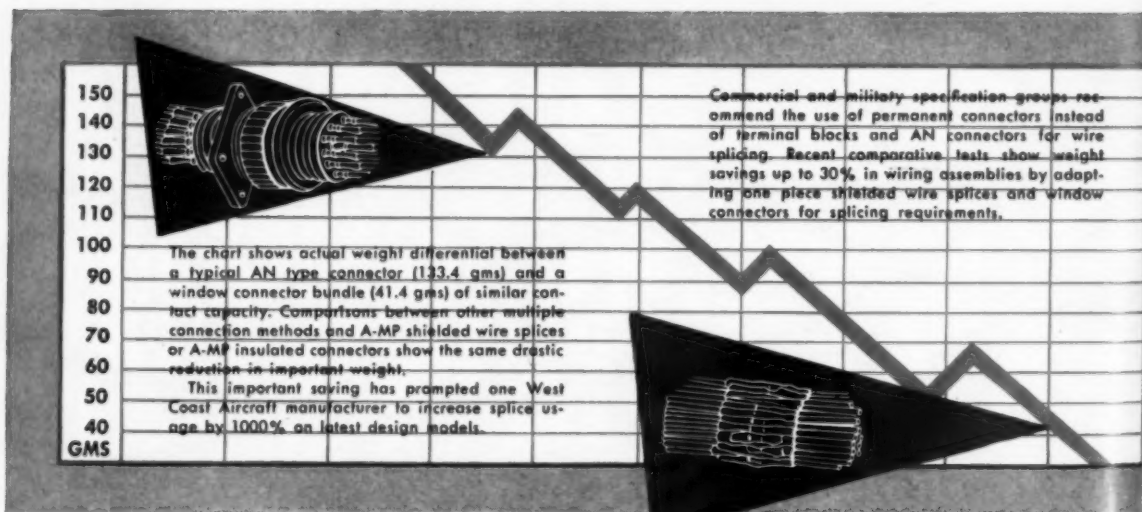


MARCH 11, 1957



*Supersonic Speed
Demands
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the
Weight
Barrier!**



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Automatic decision-maker for management

Operations Research employs electronic brain to reduce errors in human judgment

by Henry P. Steier

A management decision-making tool that got its start during World War II for making military decisions is beginning to make its impress on today's dynamic economy.

It is Operations Research (OR)—a mathematical approach to management decisions. Its use by business men to prevent economic "fires" breaking out in their business is growing.

Ways in which the new management technique is being put to work in three fields of business was disclosed at a recent Operations Research Symposium at the University of Pennsylvania.

The symposium, second of its kind ever held in the U.S., was co-sponsored by the IRE Professional Group on Engineering Management and the Society for Industrial and Applied Mathematics.

Representatives of United Airlines, Western Electric Co. and General Electric Co. told how Operations Research is at work in their firms to take the guess work out of operations and to maintain leadership in their fields.

However, as Dr. Gaylord P. Harnwell, president University of Pennsylvania, pointed out in his welcoming speech to participants, although the use of mathematical methods in decision-making is uniquely suited to do the job there are bound to be some rough spots in its adoption.

The state of OR in today's business world was keynoted by Harnwell when he said that although the use of mathematical and electronic data processing techniques for research are coming into their own, conditions of peace, unlike those of war, mean "convincing" is necessary to get OR into widespread use.

"Language is perhaps better qualified to conceal thought than express it," Harnwell said, and "it is uncongenial to many people to make exact comparisons." Nonetheless, he added, "random (business) judgment should not be allowed to run rampant in a domain where mathematical decisions are available."

UAL and OR

Primary purpose of the symposium was to discuss a specific branch of OR—use of "mathematical models" in the solution of management decision-making. However, in the case of

United Airlines, the application of OR was designed around a working prototype system of men and materials.

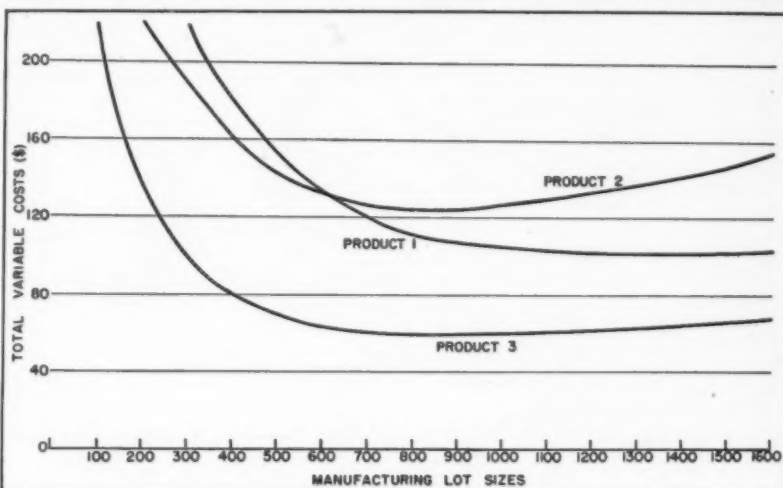
According to Winston C. Dalleck, staff superintendent of quality control, UAL, his company was one of the first to recognize the value of mathematical techniques in decision making.

UAL's OR uses what Dalleck calls analytical and Monte Carlo techniques for the manipulation of mathematical models. Working prototypes of aircraft maintenance service stations and passenger facilities have been used to

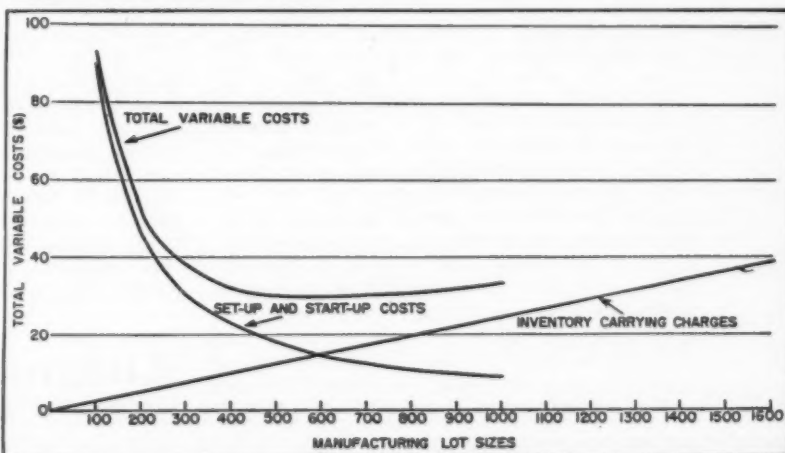
obtain data for manipulation of OR models.

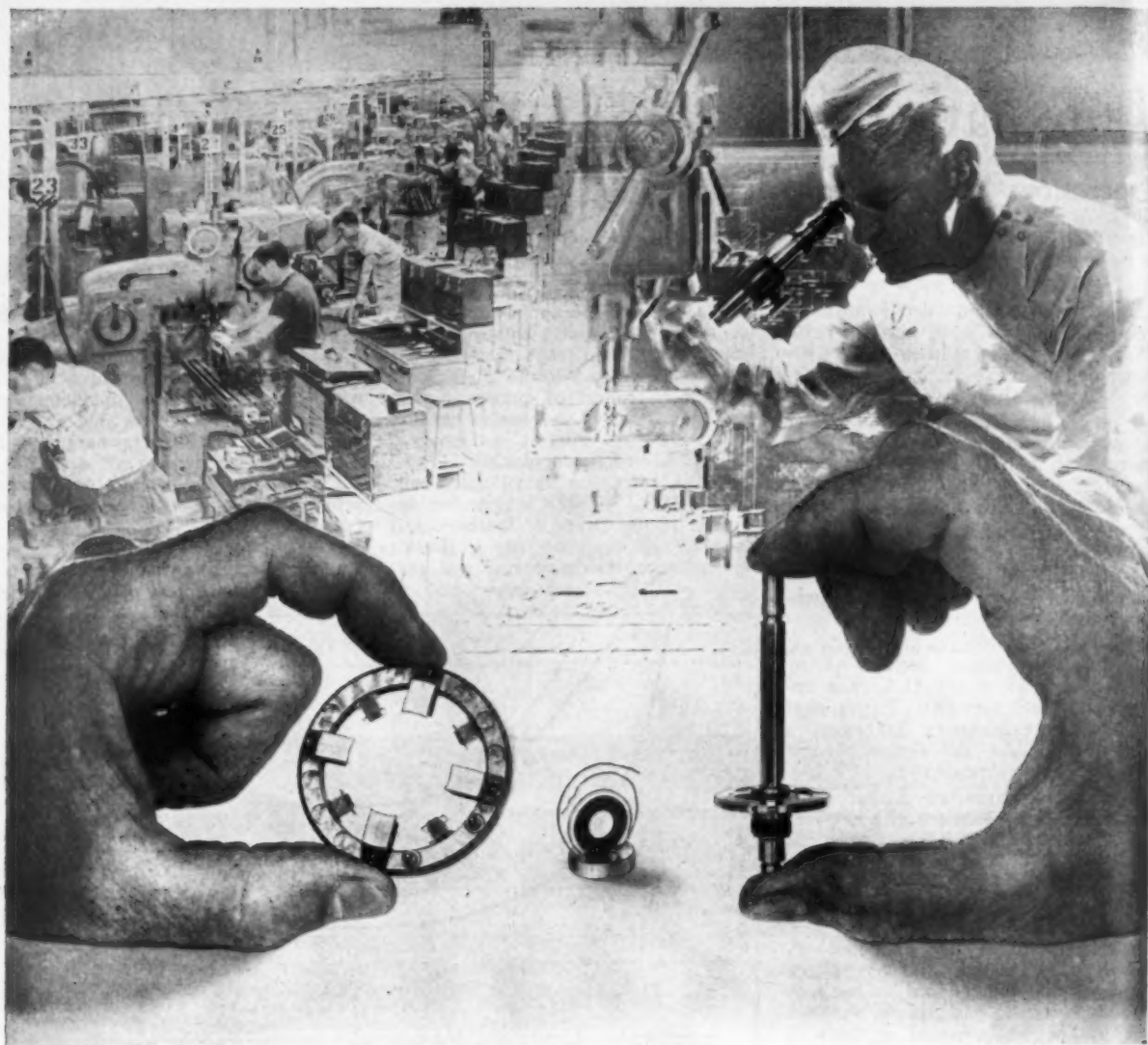
UAL uses an accounting model that looks backward, instead of a forward-looking purely mathematical model. In justification for this, Dalleck pointed out that management has a right to expect a tool to test new ideas. He said UAL selected "the biggest problem available" to run its test of OR.

The problem is aircraft routing and its effect on maintenance operations at service centers. After an initial



CURVES SHOWING RESULTS of Western Electric Co.'s Operations Research effort to determine optimum lot size for minimum cost of various products. Data are derived from mathematical models and reduced to easily understood curves for management use. Note crossovers, low points of cost curves which do not always show minimum cost for maximum lot size.





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survey, a UAL team assigned to the study found no satisfactory model service center was available from which to draw data for an OR effort.

The team was made up of dispatch managers, aerodynamic engineers, industrial engineers and Dalleck as statistician and mathematician.

The team quickly learned each service center has its peculiar problems that affect maintenance efficiency as it relates to aircraft routing and input-output time for servicing.

What was done then was to collect data on manpower availability, trip arrival time, character of the maintenance work, etc. from a selected model service station.

Although mathematical model techniques using these data were tried, the decision was in favor of the Monte Carlo approach. With this approach, the data on operational conditions will be programmed in a large computer using random numbers for different conditions.

Repeated variations of facility factors such as manpower availability, equipment, times of arrival, etc. will be run through the computer to experiment with all the expected variations and resulting possibilities likely to be encountered in operation of UAL's maintenance system for its particular airline.

Manufacturer of the computer to be used to handle the thousands of variables which will be used to manipulate the data reportedly has said the problem is one of the biggest it has encountered.

Previously UAL researchers investigated the use of analytical techniques on airline ticket counter problems. Purpose was to determine the type of counters needed for different airline conditions.

Counter characteristics related to peak customer activity, minimum customer activity, types of customers such as through-flight and exchange-flight types were analyzed.

Dalleck said the results of this study, which used a Datamatic computer to manipulate the counter model situations, "surprised management." Implication is that the results convinced management of OR's value.

Simplifying OR use

Use of mathematical models to "hit pay dirt" has been valuable in operations of the Western Electric Co., according to Robert E. Johnson.

Johnson is a member of WE's economic and actuarial department. His group is "finding ways of converting complicated, frightening, mathematical models to simple charts which will be usable by those with psychological blocks or aversion to mathematical equations."

The utility of these is great today,

Johnson said, "when management has some hot potatoes in the decision department. High money rates, tight credit, profit squeezes and mounting competition are setting a great premium on right decisions."

Despite monumental things done by engineers in improving machines, creating new products, creating new production systems, raising productivity and the like, something has happened, Johnson said.

In the language of OR people "we have sub-optimized." There is slippage between supplying units and using units of the "power transmission line."

In one OR area, Western Electric has built mathematical models for determination of economic lot sizes of production. This involves picking the lot size where unit costs, variable and non-variable, are a minimum.

One factor in this selection is inventory-carrying charges. They rise as the lot size increases. In a mathematical working model of this cost problem, a probability theory would be required as to tool life, lest the model develop an optimum working size that is impractically greater than the tools will produce.

Applying the lot size mathematical model for one product, WE reports inventory reduction of 50% and set-up time cost reduction of over 25%. These resulted in a total production cost saving of about 10% in addition to the inventory savings.

In another case, Johnson said, shop efficiency increased from 98% to 114% in less than a year.

A mathematical model is ready for test early this year that involves the output of nearly 500 products in one of WE's major plants. In this plant extensive use is made of common production facilities.

Demand in this model is affected by public fad and whim. WE has developed a servo-mechanism technique to make the model formula self-correcting for current demand fluctuations. Random numbers have been used to test the model, and WE is convinced it will operate with no chance of an "out of stock" condition or serious overstock conditions.

Another problem involving prices and transportation costs for 400 WE products defied human manipulation and, in fact, Johnson said, "defies today's largest electronic brain." More than 10,000 variables need to be treated simultaneously.

The only way out was to reduce the variables to 4,500. With this number the IBM 650 computer brain can solve the problem within 7-8 hours. The IBM 705 could do it in less than one hour.

As things stand at WE there are current mathematical model problems on which millions of dollars may be riding. Management is learning to rely on OR's decisions. Problem is to con-

vince management a mathematical model builder is no swami, but a scientist at work.

A technique that OR people sometimes use in analyzing problems for decision-making is the application of what they call the "game theory."

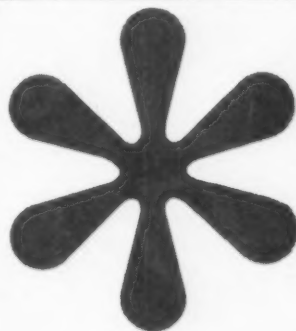
Basically this technique in its business sense uses primitive concepts of a game with players or individual decision-making units, goals, business strategies and pay-off figures.

Strategies available to any player are determined by the rules of game given in terms of resources available, disposition of the resources and the limitations of the physical moves that can be made with any of the resources and information state of the players.

Given any set of actions adopted by the players, it is possible to deduce the value to each player of the resultant state of affairs. It is something like a chess game. Resources are the chess men whose disposition on a 64-square board is defined by the way they must be arranged prior to commencement of the play.

In an industrial market with a few competing firms, the "game" would be defined by OR in terms of corporate resources, position and goals. This method stresses position of a firm as a whole in a market or competitive system.

Use of the game theory in the three management areas of advertising, investment and pricing was described by Dr. Martin Shubik of the General



*** narco**

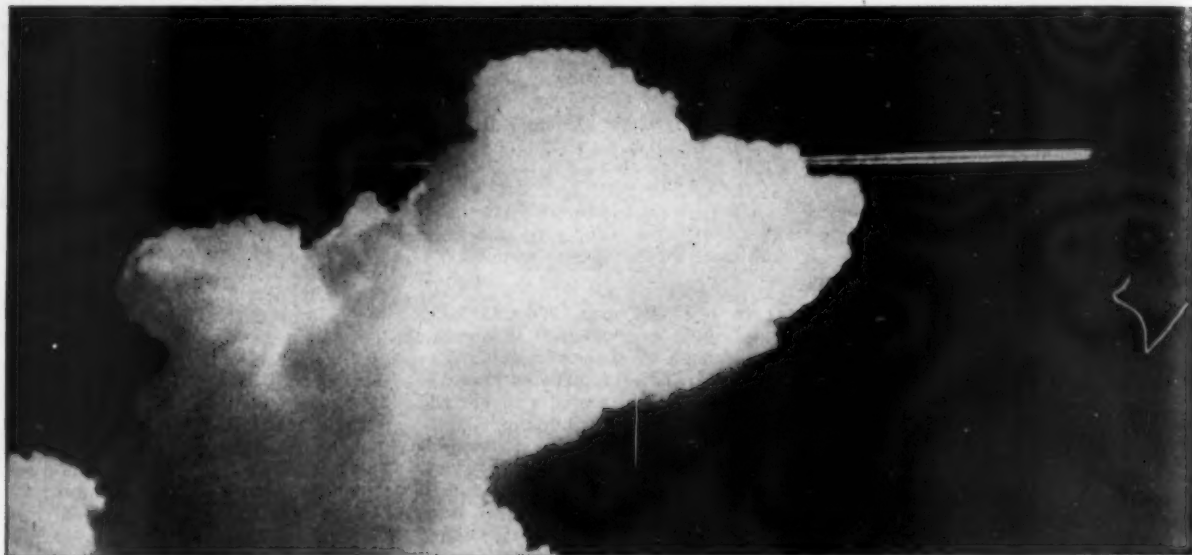
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Electric Co.'s Operations Research and Service Management Consulting staff.

Shubik said when firms bid for contracts it is often easy for manufacturing, engineering and marketing departments to fail in maintaining the appropriate synchronization of their actions.

He illustrated the importance of viewing these departmented operations as meshed parts of the same system. Taking a hypothetical case, Shubik supposed a firm that had to make a series of bids on various contracts so numerous that the firm has only enough manufacturing capacity to handle a limited percentage of orders.

This fact, Shubik said, should completely change the strategy adopted by marketing. If they have a backlog of information on the types and prices of bids which have been previously successful, they may be in a position to draw up some crude probability estimates of obtaining an order.

Curve plots of these estimates would show probability of obtaining an order as the price of the bid is raised. If the firm wishes to maximize its short-run revenue from the poten-

tial orders, Shubik pointed out, the job of marketing would be to name prices in such a manner that the appropriate portion of potential business is *lost* by overbidding, whereas enough bids are successful to utilize full capacity.

In a complete application of the game theory to OR for business use, handling of all the strategies in relation to their individual pay-offs would be determined mathematically and a choice made.

The information state during the game is an important factor. In the chess analogy the players are always informed about the disposition of chessmen on both sides.

In another form of chess called *kriegspeil* or double blind chess, the resources are the same but information conditions are different.

Kriegspeil could serve as an analogous situation to use of an intercontinental ballistic missile. Design of an ICBM might conceivably be frozen at a number of different stages of refinement determined by probability that a given design would do a given job for a given set of strategic situations.

It may not be without significance that the game of *kriegspeil* is quite popular among personnel of the Ramo-Wooldridge Corp.

SAGE no panacea, designers agree

Frequent suggestions that common facilities such as the Air Force SAGE system be used to conduct both air traffic control and air defense often show a tendency to "oversimplify" a comparison of the two needs, and leads to unwarranted generalizations, according to two of the SAGE designers.

In a paper given before the Institute of the Aeronautical Sciences meeting in New York, David R. Israel and Herbert Sherman said: "One widely used shibboleth suggests that the basic difference between the two systems is that one attempts to bring aircraft together while the other attempts to keep them apart."

• Describing the essential similarities and differences between the two systems "in a more fundamental way," the authors said air defense requirements meant little consideration could be or was given to ATC needs in the SAGE design.

The current operational design of SAGE's radars, they said, will not materially aid or assist ATC except to provide some supplementary data. SAGE operation does not require tracking of all aircraft of interest to ATC.

One difference between ATC and air defense was characterized as being like that between chaos and order. In air defense data is refreshed on a scale of seconds and now ATC is done in minutes. Another difference is degree of control. In ATC, rules are set by agreement. In air defense the enemy is uncooperative and this means different radar scan techniques are needed.

• The author suggested three system possibilities:

• A new system, independent of SAGE, might use some of the military radars but different computers and centers.

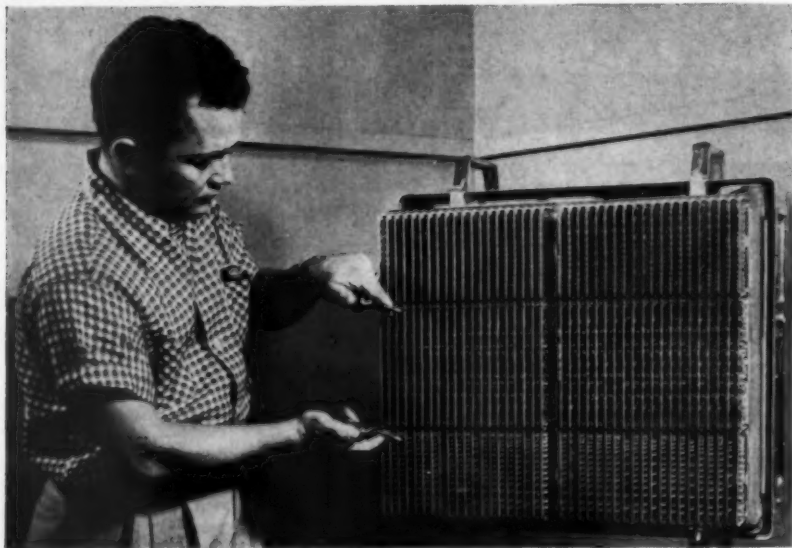
• Use of a common air defense-ATC system in which SAGE facilities are augmented to handle the increased ATC load.

• Use of SAGE centers to execute air surveillance and tracking, but employing separate computers at ATC control centers.

Technical and economic limitations that formerly restricted consideration of shared facilities between ATC and air defense are being removed, the authors said. Information from three radars which normally feed a SAGE computer could now be remoted by new techniques to the Idlewild Center for one-third the installation cost of a single new radar in New York.

A pressing problem in the field of transponder beaconry could arise, they said, because of future inadequacy of the current proposed system for use in a combined air defense-ATC environment. The present system, they predicted, has a "very limited operational life in the face of demands that are likely to be made on it."

Transistorized computer weighs only 200 lbs.



TEST SUPERVISOR D. H. Drozd, Autonetics division North American Aviation, demonstrates use of extracior tools to remove plug-in circuit boards from new CP-266 Air Force computer developed by the company.

A computer that weighs only 200 pounds but has a working capacity of a computer that would fill an average size living-room has been delivered to the Air Force Rome Air Development Center.

The all-transistor digital computer was designed by Autonetics division of North American Aviation. It is designated CP-266.

A built-in refrigeration system allows operation of the new computer in

an ambient temperature of up to 120°F. Printed wiring boards were used to construct the unit and are mounted on hinged panels for easy access to components and wiring.

Exact application of the computer to AF work has not been announced, but it will be used for data reduction in the field. For this reason particular attention was paid to design of a rugged package that occupies only 6 cu. ft.

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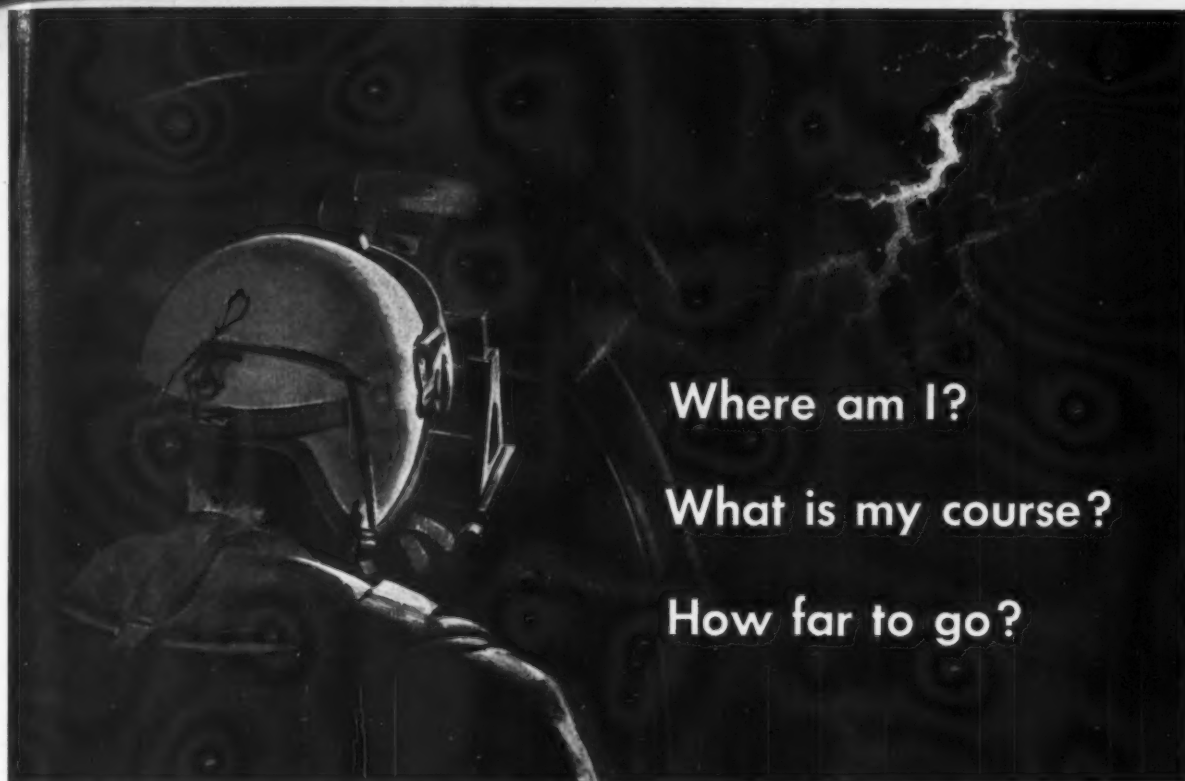
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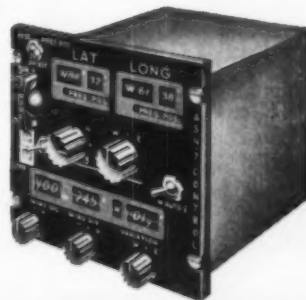
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MARCH 11, 1957

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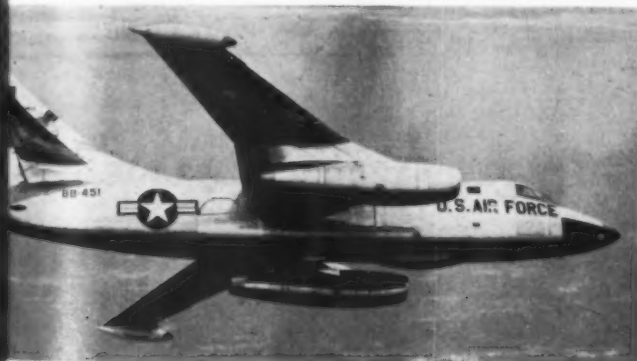
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FIAT G 91 PROTOTYPE light ground attack fighter is rated as supersonic. Second prototype is nearly completed; 27 of pre-series are to be built.

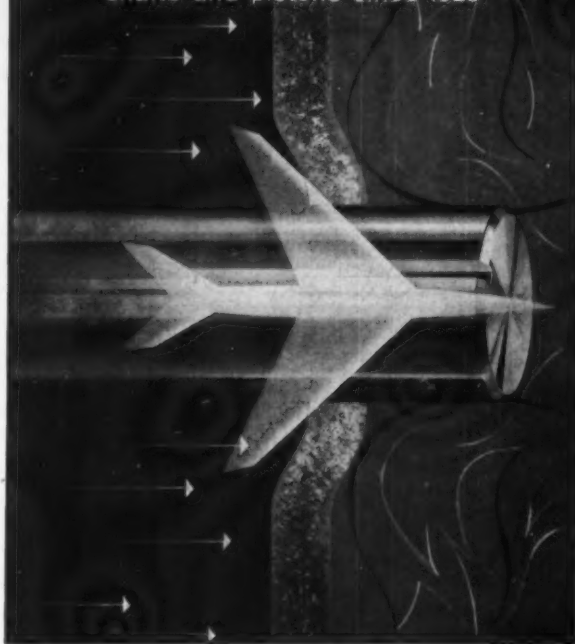


LAST OF 3,180 Douglas AD Skyraiders is shown leaving the assembly line at the company's El Segundo, Calif., division. It was last prop-driven plane for plant.

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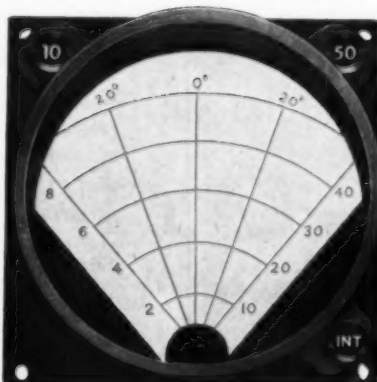
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a realistic radar image of full-scale "enemy" aircraft.

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When a USAF TM-61 Martin Matador leaps from its launcher, it has passed its point of no return. Its mission calls for a one-way trip to the target. The Matador must function perfectly if its mission is to be accomplished. There is no turning back for repairs.

Fuel flow plays a vital part in sending the Matador to its objective. At the speed it travels even a momentary interruption could cause serious deviation in flight characteristics. Martin needed a filter to remove foreign material from the fuel. A filter that would function perfectly, yet be expendable, light in weight, resistant to corrosion. The filter had to have a minimum shelf life of two years. They came to Purolator for a special design.

The Purolator filter designed for use in the Matador filters down to 5-10 microns at a flow rate of 18 GPM. It can be connected directly to auxiliary fuel tanks outside the missile so that fuel on board is not consumed during pre-flight calibration operations. Its construction is resistant to corrosion, has the required shelf life, yet it is lightweight and expendable. A perfect example of Purolator's ability to engineer and manufacture filters for special needs . . . no matter how stringent the requirements are.

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Liquid-level switch uses radioactive material

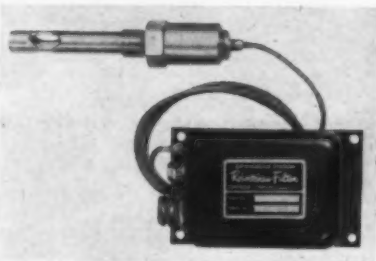
The aeronautical division of **Robertshaw-Fulton Controls Co.** has developed a liquid-level switch that utilizes a radioactive material in the sensing element for the control of critically important fuel levels in supersonic aircraft and missiles.

The switch is designed to meet the need of the airframe industry for a fuel level control that will perform reliably and accurately in conditions of extreme temperatures, vibration and shock, as well as with most missile fuels.

In many missile operations, a failure in fuel-level determination at supersonic speeds can alter a vehicle's center of gravity sufficiently to send it off course or out of control. In other cases, a failure may quickly burn out the powerplant of a rocket-powered aircraft or missile.

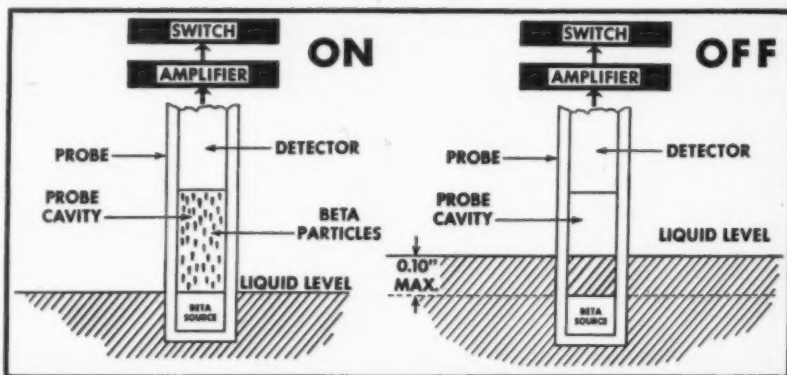
Said to be smaller, lighter and more durable than any similar device, the Robertshaw-Fulton switch consists of a pencil-size sensing probe containing a hermetically sealed beta source (high-speed electrons) and a beta detector (Geiger-Mueller tube) that is mounted inside the fuel container.

The beta source and detector are separated by a small cavity into which the liquid may flow. When no liquid is present, radioactive particles pass from the beta source to the detector tube. When liquid enters the cavity, however, it absorbs the radioactive particles, thus reducing the radiation level at the detector.



The liquid level switch operates on 28 volts dc, at .05 amps. The double-pole, double-throw relay will switch a 2-amp. load. Signal response time is approximately 1/20th sec. and accuracy $\pm 1/10$ " whether the liquid is rising or falling.

The unit operates successfully under conditions of vibration and shock of 15 Gs up to 2,000 cycles per sec. and under ambient temperatures ranging from -10° to 125° F. The $\frac{1}{2}$ " x

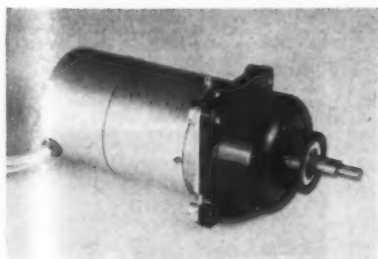


The change in radiation is converted to an electrical signal that is amplified by a transistorized circuit which, in turn, actuates a relay. The relay is used to switch on warning lamps, valves or servo motors that can instantly start correcting fuel distribution throughout a plane or missile.

$\frac{1}{4}$ " probe is fabricated of anodized aluminum, weighs 2 oz. and is designed to fit a standard AND fitting in accordance with MIL-S-7742.

The transistorized amplifier measures $3 \frac{3}{34}$ " x $2 \frac{5}{16}$ " x $1 \frac{1}{4}$ " and weighs 7 oz.

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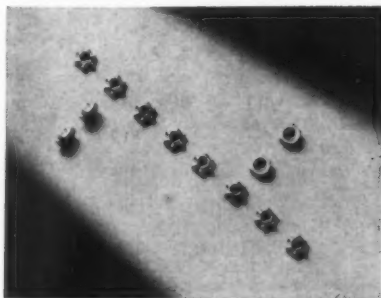


Miniature gear head motor

A miniature gear head motor has been developed by **Western Gear Corp.** Specifications are 115 volts dc ± 5 volts dc. Output speed is 12.5 rpm $\pm 25\%$. Gear drain is 100 ma.

The dc motor is designed for intermittent duty and is reversible. The motor conforms to military specifications MIL-M-8609 (ASG) and missile purchase description MPD-401.

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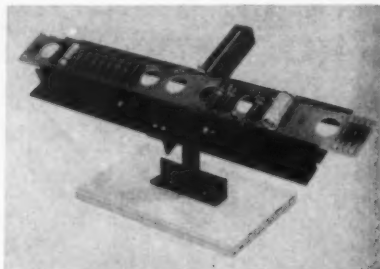


Steel locknuts

Lightweight steel locknuts for aircraft developed by **Standard Pressed Steel Co.** incorporate a design said to save as much as 43% in weight compared to conventional locknuts.

Cadmium-plated to resist corrosion, they feature one-piece design and full wrenching area, and are intended for applications up to 550° F. Available in 10-32 and $1/4$ -28 sizes.

Circle No. 70 on Reader Service Card.



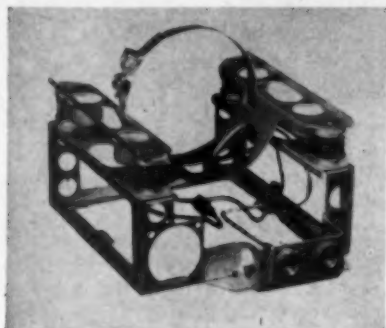
Electronics assembly vise

A snap-in vise for holding printed circuit and terminal boards during assembly is manufactured by **Western Electronic Products Co.**

The vise can be adjusted for a particular board size. Spring loaded jaws permit easy insertion and removal. The vise is mounted on a swivel for convenient positioning. Boards up to more than 24" long and 1" to 6" in width may be held.

Circle No. 58 on Reader Service Card.

NEW PRODUCTS



All-metal mounting

Robinson Aviation, Inc. is producing a center-of-gravity all-metal mounting system for a pressure ratio transmitter unit developed by Minneapolis-Honeywell for airborne applications.

Model 1323 Met-L-Flex mounting incorporates pressure and electrical connectors as part of the supporting structure of the mounting and, in effect, combines equipment and mounting into an integral package.

Natural frequency of the unit is between 6 and 11 cycles per sec., while the amount of vibration isolation provided is approximately 90% at 40 cps.

Circle No. 65 on Reader Service Card.



Pressurization pump

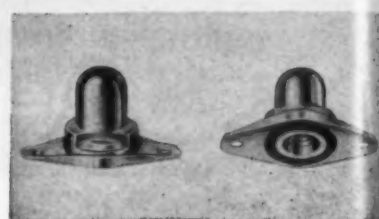
A pressurization pump weighing 6.5 lbs., with motor, manufactured by The Corneliuss Co., delivers free air at 1,728 cu. in. per min. at 25 psi discharge at sea level.

Designated Model 283 Series, the pump may be used for radar pressurization, air-pressurized water systems, fluid system pressurizing and de-icer boot system pressurizing.

Diaphragm construction eliminates pistons and cylinders.

The unit is provided with ac or dc motor drive and as a "kit" with any combination of the following: gauge or absolute-pressure switch, relief valve or combination vacuum-pressure relief valve, check valve and chemical dehydrator. Air entering the pump is filtered. Literature is available.

Circle No. 61 on Reader Service Card.



Self-sealing anchor nut

The Kaylock Division of The Kaynar Co. has introduced a fuel-resistant, self-sealing floating anchor nut intended principally for use in fuel tanks.

Kaylock's new anchor nut has also been designed for pressurized cabins, cockpits and other areas where positive sealing against gases and liquids is required.

Designated Part No. F1968, the nut contains an integrally molded rubber seal. This eliminates the inconvenience and uncertainty of using sealing compounds to accomplish the same purpose.

The Kaylock nut assures a tight, continuous seal against gas and liquid pressures normally encountered in aircraft applications (-14 to 50 psi).

The nut element floats independently of the seal, to accommodate mis-alignment in assemblies. The sealing element, made of rubber, is resistant to aircraft fuels, oil, salt water and most organic solvents.

Circle No. 66 on Reader Service Card.

PARTS

of highest precision
for
**INSTRUMENTS
MISSILES
ROCKETS**



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small parts requiring
extremely close toler-
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FOR CREW . . . No. 114000 Nasal type mask. Constant flow, rebreathing mask; plastic nose piece; latex rubber bag. Perfect air flow from nose piece to bag provides free, easy breathing. Needs no microphonic connections. Cool and comfortable to use, and priced at only \$8.25 ea. F.O.B. Kansas City.



DISPOSABLE, PLASTIC MASKS FOR PASSENGERS . . . No. 114011. Gives comfort and appearance that passengers want and expect. Gives you a mask that requires no time consuming assembly or sterilizing after use. Considered the most comfortable disposable mask on the market today and priced at only \$1.00 each. (Individually packed.) F.O.B. Kansas City.

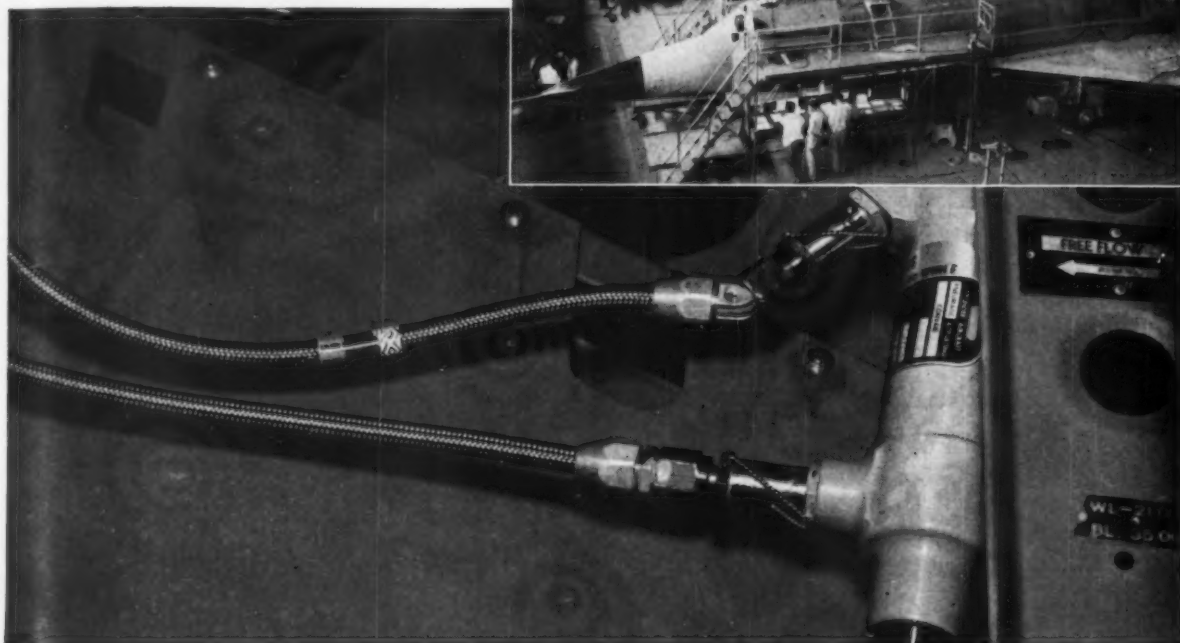
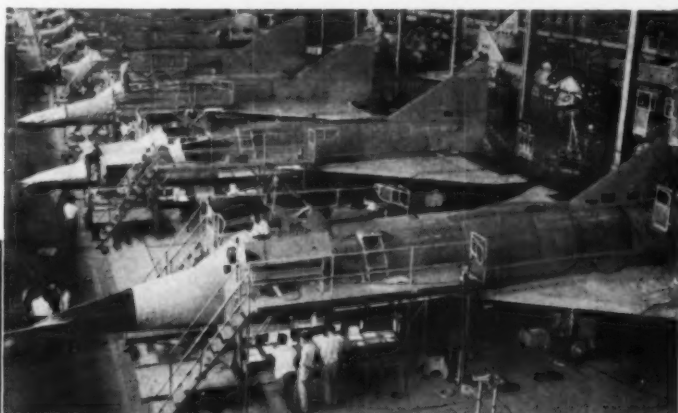


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AMERICAN AVIATION

Aeroquip Teflon Hose on the F-102A

**ONLY AEROQUIP 666
TEFLON* HOSE and REUSABLE
"super gem" FITTINGS are
used for PNEUMATIC LINES**



This pneumatic actuating cylinder in the supersonic F-102A, all-weather jet interceptor, is shown with Aeroquip 666000 Hose Assemblies attached.

On Convair's fast new F-102A jet interceptor, now in quantity production, Aeroquip 666 Teflon Hose with "super gem" Fittings are used for pneumatic lines. Made to the highest quality standards in the industry, Aeroquip Teflon Hose Lines assure dependable performance—always.

Aeroquip "super gem" Fittings for Teflon Hose are detachable and reusable. They grip the reinforcing braid of the hose without harmful compression of the Teflon inner

tube. This important design feature prevents leaks due to cold flow characteristics of Teflon.

Aeroquip 666 Teflon Hose and "super gem" Fittings simplify problems of production changes, engineering mock-ups, and greatly facilitate field maintenance. Hose and fittings can be hand assembled with bench tools.

Write today for Bulletin AEB-13 giving full engineering information on Aeroquip 666 Teflon Hose and "super gem" Fittings.



*DuPont trade name for tetrafluoroethylene resin. "super gem" is an Aeroquip Trademark.

Aeroquip

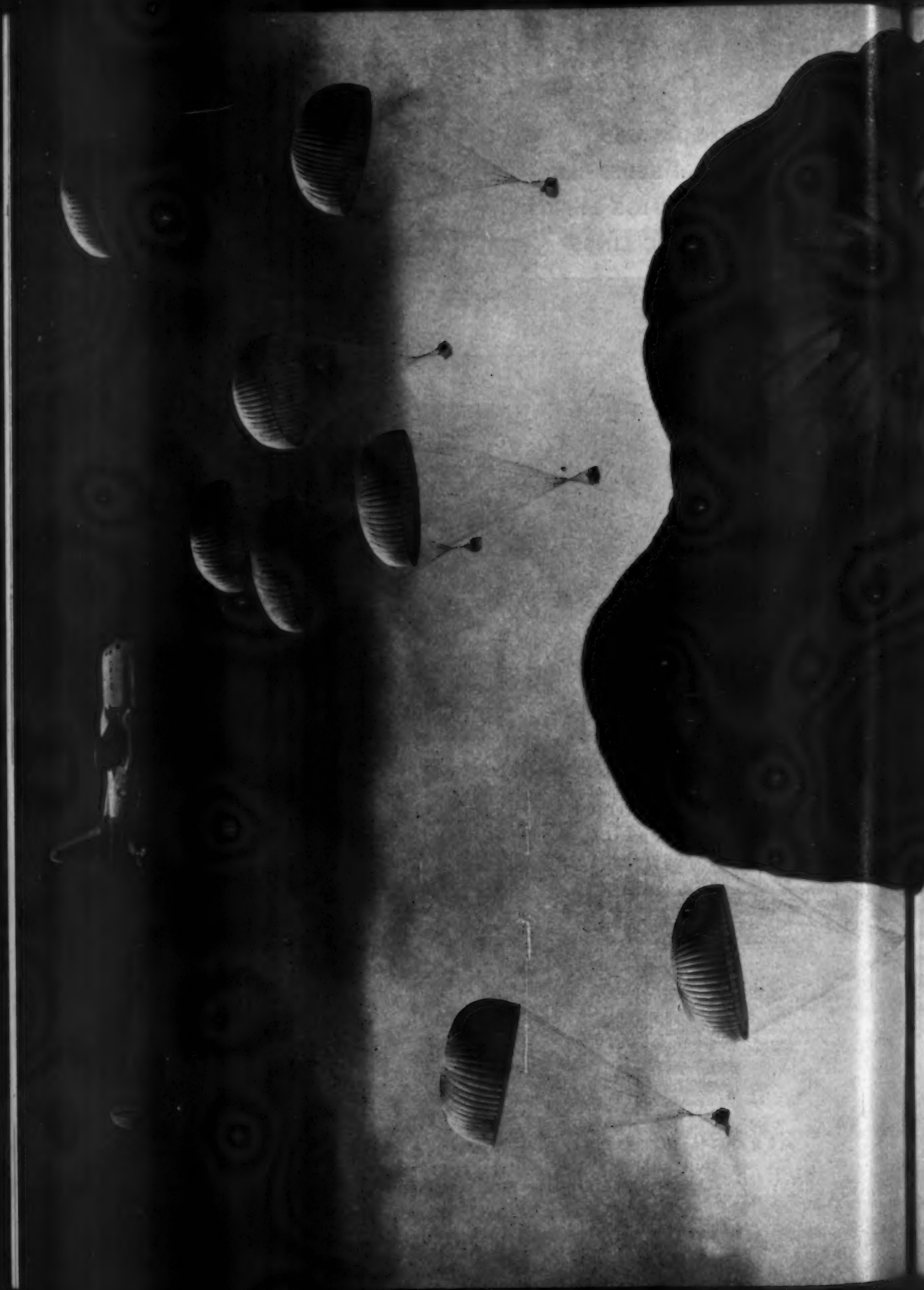
**AEROQUIP CORPORATION, JACKSON, MICHIGAN
AEROQUIP CORPORATION, WESTERN DIVISION, BURBANK, CALIFORNIA
AEROQUIP (CANADA) LTD., TORONTO 10, ONTARIO**

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MARCH 11, 1957

Circle No. 11 on Reader Service Card.

63





Lockheed C-130's paratroop 25,000 pound loads on-a-dime, in seconds

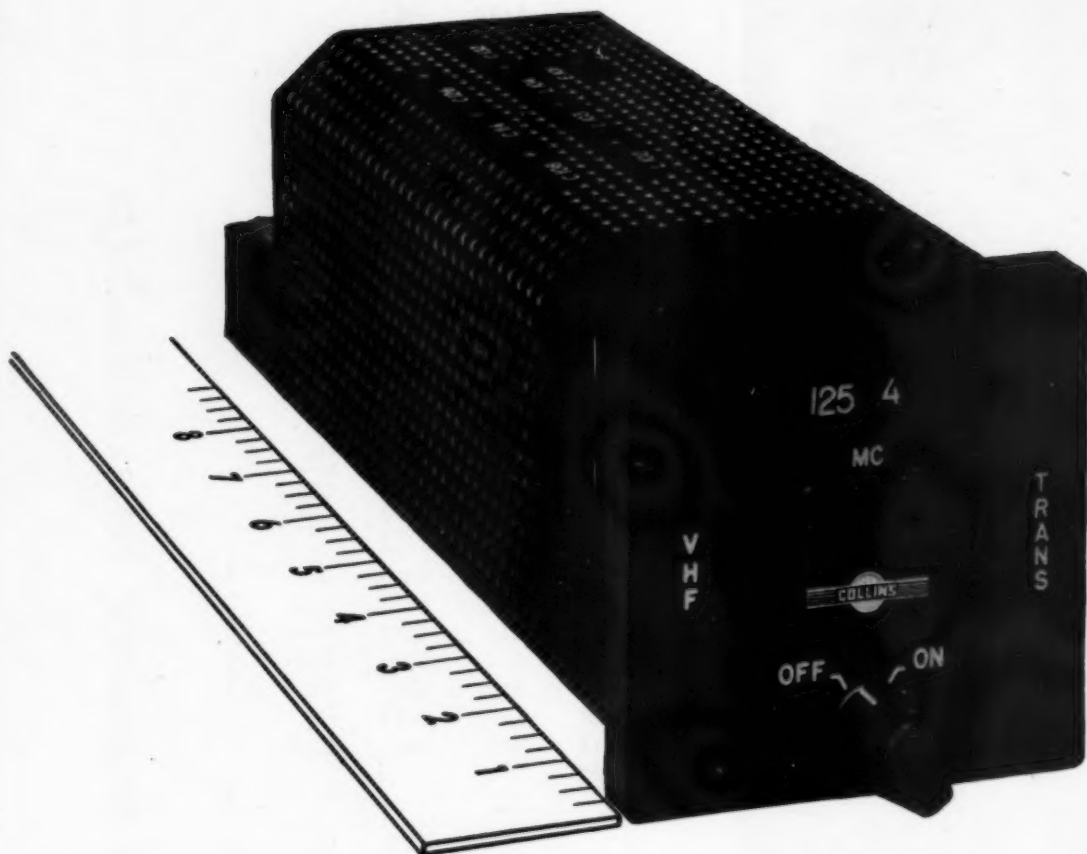
LOCKHEED'S C-130 HERCULES, NEW PROJET "STRONGMAN" OF
TACTICAL AIR COMMAND'S 18TH AIR FORCE, CAN AIRLIFT MORE
FIGHTING MEN AND EQUIPMENT FARTHER, FASTER, AND AT LOWER
COST THAN ANY COMBAT CARGO CARRIER NOW IN SERVICE.



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HERCULES COMBAT CARGO CARRIER • B-47 MODERNIZATION • NUCLEAR-POWERED AIRCRAFT RESEARCH & DEVELOPMENT

This is the actual size



of Collins midget-sized giant performer



Collins new 17L-8 pint-sized transmitter will be wanted by anyone with an aircraft — airlines, business aircraft, or private plane. Provides excellent regular or standby transmitter service and Collins high reliability and extra service performance. 90 crystal controlled channels — 118 to 126.9 mc and 3 watts into a 52 ohm antenna. In a 3" instrument case slightly over 8" long. All controls front panel. Separate 427A-1 transistorized modulator-power supply is only 7"x4½"x3½" and mounts anywhere without shockmounts. Total weight 3 pounds. For DC only.

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NEW PRODUCTS



Ratio plotter

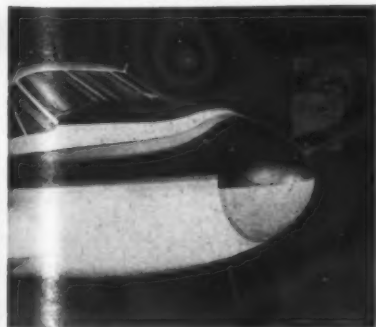
An automatic and continuous plotter developed by **Inso Division, Barry Controls Inc.** accepts two ac varying voltages from two transducers and plots a curve on the ratio between the two.

The units can handle outputs representing stresses, loads, flow rates, displacements, accelerations, pressures, etc.

A range of four settings permits plotting of ratios of 0-2, 0-1, 0-10 and 0-100. Ranges for the ratio denominators are 0-20, 0-50, 0-100, 0-200, 0-500 millivolts and 0-1, 0-2, 0-5, and 0-10 volts.

Frequency response is $\pm 2\%$ from 5-2,000 cps and $\pm 2\frac{1}{2}\%$ from 2,000-4,000 cps. Chart speed is variable from 6-960 inches per hour.

Circle No. 50 on Reader Service Card.



Beechcraft radome

A radome for Beechcraft D-18 and B-18 aircraft has been developed by **Chamberlain Aviation Corp.** Designed for use with weather avoidance radar, the radome is made of molded fiberglass in "sandwich" construction.

The unit is available in kit form with all installation parts. No structural modification of the aircraft is required. The radome was planned for location of radar components in the nose compartment. It is hinged for access to the compartment.

Circle No. 51 on Reader Service Card.

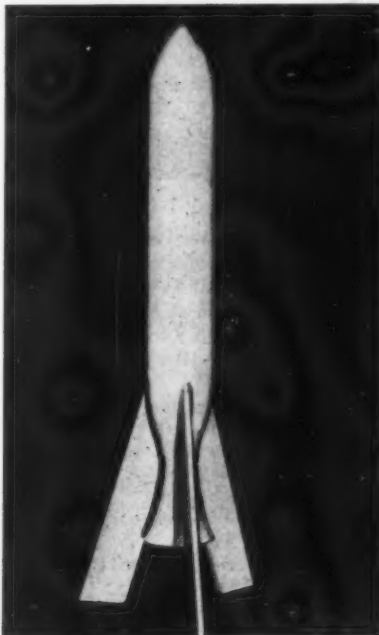


Tank filler cap

A new aircraft tank filler cap, Model FC-3500, has been announced by **Gabb Special Products, Inc.** The cap is not limited to aircraft uses but can be used wherever pressure sealing is required.

The self-contained unit may be opened and closed by a lever action that automatically relieves any pressure in the tank before the cap is unlocked. A 35-degree turn removes the cap. Quick maintenance with standard O-rings is possible. Cap sizes are 1.5, 2.3 and 3.82-in. openings.

Circle No. 30 on Reader Service Card.



All-plastic rocket

Haveg Industries, Inc. has produced an experimental all-plastic 9-foot rocket molded from asbestos-filled phenolic resin.

When machined and polished, the plastic surface has an extremely low coefficient of friction so that minimum heating occurs. The rocket is said to perform satisfactorily in the 8,000-10,000°F range.

Radome and firing tube were molded and threaded to demonstrate ease of accurate machining. The rocket can be assembled or disassembled by one person without tools.

Circle No. 67 on Reader Service Card.

RELIEF VALVES



By
M.C. MFG. CO.

MC 1613 VALVE—RELIEF

Meeting the following specifications:
 FLUID: Air or Nitrogen
 PRESSURE RANGE: 500 to 3500 psi
 TEMPERATURE RANGE: -65°F to +250°F
 FLOW: 4 SCFM
 INLET PORT: Per AND 10056-4
 OUTLET PORT: Free to atmosphere
 INTERNAL LEAKAGE: Zero
 EXTERNAL LEAKAGE: Zero
 ENVELOPE: .75 hex x 3.01 inch
 WEIGHT: .12 lbs.
 SETTING: To customer requirements
 MILITARY SPECIFICATION: Applicable paragraphs of MIL-P-5518 and MIL-P-8564

Hydraulic and Pneumatic Components for the Aircraft Industry

VALVES OF ALL TYPES: Relief • Solenoid • Manual Control • Transfer • Shuttle • Brake • Control • Fluid • Pressure Reducing • Restrictor and Special

ALSO: Air Compressors • Fuel Pumps • Dehydrators



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Pastushin



FLUID-TIGHT JACKETED RIVETS



This photomicrograph of a sectioned specimen illustrates the sealing principle of the Pastushin Slug Rivet. Standard sizes 5/32"-3/16"-1/4"... other sizes available.

...flight tested millions of miles



Flight tested by millions of rugged air miles flown by the finest commercial and military aircraft. Pastushin Fluid-Tight Rivets automatically seal themselves when they are driven, without the use of conventional sealants.

Sealing is accomplished by the use of a soft aluminum sleeve which extrudes into any wall cavity as the rivet is being driven.

Pastushin Rivets are available for immediate delivery—Here is just a partial list of users:

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BRANIFF AIRWAYS, INC.
CALIFORNIA EASTERN AVIATION, INC.
CANADIAN PACIFIC AIRLINES, LTD.
CAPITAL AIRLINES, INC.
DELTA AIR LINES
EASTERN AIR LINES, INC.
PACIFIC SOUTHWEST AIRLINES
JAPAN AIR LINES
KLM ROYAL DUTCH AIRLINES
NATIONAL AIRLINES, INC.

NORTHEAST AIRLINES, INC.
PAN AM WORLD AIRWAYS, INC.
SABENA BELGIAN WORLD AIRLINES
SCANDINAVIAN AIRLINES SYSTEM
SLICK AIRWAYS, INC.
TRANS-CANADA AIR LINES
TRANSOCEAN AIRLINES
UNITED AIR LINES, INC.
WESTERN AIR LINES, INC.
USAF INSTALLATIONS
USNAS INSTALLATIONS



Pastushin Fluid-Tight Jacketed Rivets are available for use with automatic machines and for installation where hand-driven equipment is required. Both types give absolute Fluid-Tight construction. The Pastushin Repair Kit is available for field applications. Ask for Bulletin PA-3, which gives full instructions for its use.

Write for Slug Rivet catalog PI-5 and No. PA-3 for details on the Pastushin Repair Kit.

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DEVELOPERS AND MANUFACTURERS OF AIRCRAFT FASTENERS



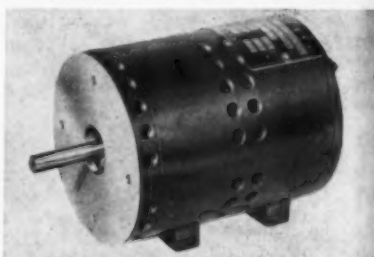
Hydraulic check valve

Tactair Division of Aircraft Products Corp. has introduced an aluminum alloy check valve for 3,000 psi service that is said to be 55% lighter than conventional steel check valves.

Approved as MS 28890-8, the valve is one of seven sizes in the new Tactair Series 1800, a heavy-duty line of cone-type check valves. Rated flow capacity is from 1.2 to 29 gpm and ambient temperature range is from -65° to 160°F.

Four sizes of the Series 1800 valves are made of high-strength aluminum alloy. Three other sizes are made of steel.

Circle No. 64 on Reader Service Card.



Aircraft motor

A 5,500 rpm, 8-pole induction-type motor for airborne fan, pump and actuator applications is being produced by the Aircraft Division of U. S. Electrical Motors, Inc.

The motor operates on a 3-phase, 400-cycle, 200-volt alternating current and delivers 1/2 hp continuously to 50,000 ft. altitude. It weighs 4.5 lbs.

Circle No. 62 on Reader Service Card.



Subminiature relay

Electronics division of Elgin National Watch Co. has announced a high precision subminiature relay with both solder-lug and plug-in terminals.

The DPDT relay is designed to operate up to 125°C with a contact rating of 2 amps at 28 volts dc or 115 volts ac. The relay will withstand 10 to 80 cps at 0.06 maximum excursion and 80 to 2,000 cps at 20G acceleration. Size is 1" x 3/4" x 1/4". Weight is .44 oz.

Circle No. 57 on Reader Service Card.

AMERICAN AVIATION

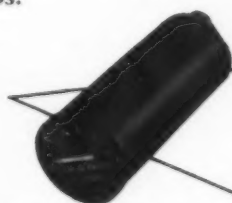
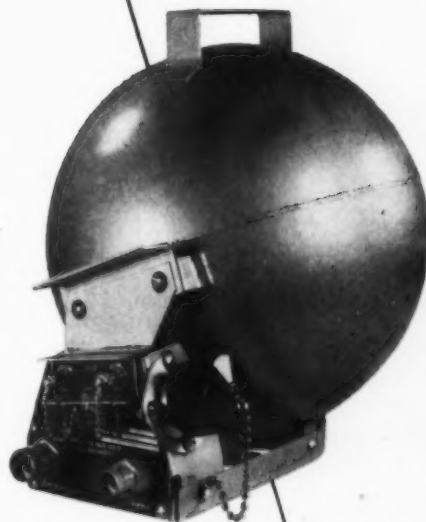
new **ARO** 5-Liter Liquid Oxygen Container



...with Integral Tank
Unit for Capacitance Gauging
of Liquid Level,

Now Used on North American's FJ-3 and 4 Navy Fighters.

The Liquid Oxygen Container, developed in Aro's Cryogenics Laboratories, establishes a new standard for equipment of its type. The integral variable capacitance tank unit gives accurate liquid level indication under all service conditions when used in combination with a null-balanced Power Unit Indicator. The container can be quickly removed and re-installed, thereby allowing remote refilling away from the carrier deck or other congested areas. A Filler Valve qualified to MIL-V-25469 is an integral part of the Container, and is easily accessible when refilling the Container aboard the aircraft is desired. Burst pressure of the Container is in excess of 2,000 psi, and the entire assembly weighs only 10 lbs.



Combination Power Unit Indicator can be supplied with Container. Operates on 110-volt 400-cycle power.



Valving required for system operation can be supplied with Container.



THE ARO EQUIPMENT CORPORATION
Bryan, Ohio, Aircraft Division
PIONEERS IN CRYOGENIC EQUIPMENT
Plants in Bryan, Cleveland, Los Angeles,
Toronto, Ontario, Canada

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TEFLON[®] hose

**with years of
flight service**

◀ ...and a patented tube

TEFLON HOSE is the most reliable type of flexible line for continuous operating temperatures of -65°F to $+450^{\circ}\text{F}$ and for corrosive fluids . . . even nitric acid.

The patented compound of Teflon used in Fluoroflex[®]-T hose makes it unique. This compound imparts high tensile and tear strength . . . assures a

leakproof seal at the coupling . . . provides thin wall tubing with proper flex life. With Fluoroflex-T hose, you're sure of high integrity, aircraft quality lines.

Resistoflex is the first and leading hose assembly manufacturer extruding its own Teflon tubing and having full control of tube quality and entire hose assembly. Over 4 years successful flight service stand back of this original Teflon hose. Send for details.

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• DuPont trade mark. • • Resistoflex trade mark.

IF IT'S NEWS IN
TEFLON HOSE - IT'S SURE TO BE
FLUOROFLEX-T

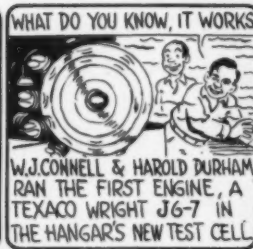
20th year of service to industry

Resistoflex

SAC

Silver Jubilee Newsreel

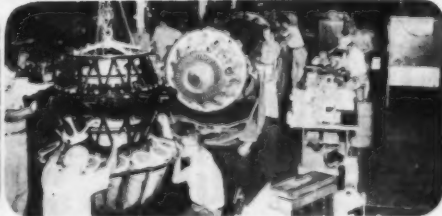
BY JACK PATTON



The new hangar—adjacent to an "Army Air Corps" relic from World War I—was private flying's best. It covered 30,000 sq. ft., contained business aviation's top engine overhaul shop (lower photo).



Now Hangar 4 is but a part of SAC's 100,000 sq. ft. Engine Division, home of America's finest overhauls for private owners and for airlines (lower left) SAC's first, too, in the Jet Age under Air Force and Navy contracts (lower right). Private and airline jets are next!



1932 — A QUARTER CENTURY OF LEADERSHIP — 1957

Southwest Airmotive Co.

LOVE FIELD DALLAS

DIVISIONS: KANSAS CITY, KANSAS / DENVER, COLORADO

NEW PRODUCTS

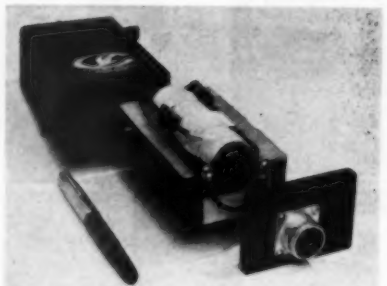


High-pressure gauge

Rochester Manufacturing Co. of California is now manufacturing the Lindsay high-pressure gauge for aircraft, missiles and missile launchers. This company is a wholly-owned subsidiary of Rochester Manufacturing Co., Rochester, N. Y.

Gauge will withstand high overload pressures as great as twice the indicated scale reading and extreme vibration in the order of 5,000 cycles per sec. and high acceleration values up to 40 Gs.

Circle No. 69 on Reader Service Card.



Silver-zinc battery

A silver-zinc battery based on a simplified fluid-transfer principle, de-

veloped by the Frank R. Cook Co.'s Electrochemical Division, produces 28 volts at 700 watts for two minutes. Other models yield voltage outputs up to 500 and current outputs to 1,000 amps.

The unit illustrated measures $2\frac{1}{8}'' \times 3\frac{1}{8}'' \times 5''$, weighs $1\frac{3}{4}$ lbs. A double set of electrically-ignited gas generators produces all of the pressure required.

The battery is being used in missiles and in airborne equipment where an instantly available source of closely-related electric power is required. It operates at ambient temperatures between -65° and 240°F .

Circle No. 60 on Reader Service Card.



Goniometer

A goniometer for testing and adjusting precision potentiometers, synchros and other rotary equipment is available from Electro-Mec Laboratory, Inc.

A precision engraved $4\frac{1}{2}''$ -diameter protractor is used with a vernier to read to one minute of arc. Accuracy of graduation is ± 15 seconds.

The device provides a means of mounting the instrument under test and will accommodate six different diameters in the range of .750" to 2.875". Shaft diameters from .078" to .250" can be accommodated. The unit measures $8'' \times 10'' \times 9''$ and weighs 10 lbs.

Circle No. 59 on Reader Service Card.

HAVE YOU TRIED...

FLIGHTEX GLASS CLOTH

FLIGHTEX FABRIC
REGISTERED U.S. PAT. OFFICE
**WORLD'S PREMIER
AIRPLANE FABRIC**

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Leading Manufacturers of Fabrics and Tapes for the Aircraft Industry

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Among them are:

- air-conditioning
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- heat transfer
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- electronic computers and controls
- turbomachinery

The Garrett Corporation is also applying this engineering skill to the vitally important missile system fields, and has made important advances in prime engine development and in design of turbochargers and other industrial products.

Our engineers work on the very frontiers of present day scientific knowledge. We need your creative talents and offer you the opportunity to progress by making full use of your scientific ability. Positions are now open for aerodynamicists ... mechanical engineers

... mathematicians ... specialists in engineering mechanics ... electrical engineers ... electronics engineers.

For further information regarding opportunities in the Los Angeles, Phoenix and New York areas, write today, including a resume of your education and experience.

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17 million hours of operation...



AiResearch Cabin Air Compressors

Latest designs will soon appear on the most modern turbo-jet (unit shown) and turbo-prop air transports

Cabin air compressors by AiResearch are turbo-driven, shaft-driven or hydraulically-driven. They provide cabin airflows up to 60 pounds per minute at 40,000 feet, with pressure ratios up to 4.3. Their dependability and durability have been service-proved by the

most extensive experience in this field — 4000 of these units are now in operation.

These compressors are integrated into complete air conditioning systems. The utmost compatibility is assured, since AiResearch manufactures every component and has

experience in every problem of interrelationship between components. We have assumed complete system responsibility in this field for many of America's finest present and projected airliners.

Whether your problem involves components or complete systems, we invite your inquiries.

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CABIN AIR COMPRESSORS • TURBINE MOTORS • GAS TURBINE ENGINES • CABIN PRESSURE CONTROLS • HEAT TRANSFER EQUIPMENT • ELECTRO-MECHANICAL EQUIPMENT • ELECTRONIC COMPUTERS AND CONTROLS

MARCH 11, 1957

Circle No. 15 on Reader Service Card.

73

NEW PRODUCTS

Induction motors

Electromotive Division of Task Corp. offers a new line of lightweight high-performance motors, said to provide extremely low motor freight to power ratios, frequently lower than 1 lb. per hp. Model shown weighs 4.8 lbs., is rated at $6\frac{1}{2}$ hp, 24,000 rpm, 3-phase, 208 volts, 400 cycle.

Other design features include totally enclosed, explosion-proof construction, air cooling, environment-free liquid cooling and long-life ball bearings.

Motors are available in standard or custom models and for power outputs from 10 watts to 1,000 hp.

Circle No. 63 on Reader Service Card.

Pressure switch

A tiny pressure switch for pressure indication is available from the Aircraft Controls Co. Division, Gorn Electric Co., Inc. Designated the GPI-2000, the switch is mounted through the wall of a pressurized vessel.

The bellows compression completes a signal circuit when the pressure change in the vessel is at a prescribed value. The switch itself is grounded and the circuit completed through a pigtail.

The unit will make and break a

six to eight-volt resistive circuit, carrying up to 250 milliamps. It will operate satisfactorily even after being subjected to violent physical and environmental shocks encountered in missile and aircraft applications.

Circle No. 27 on Reader Service Card.

Transceiver test set

An electronic test instrument, the RT-500 transmitter-receiver test set, similar to an equivalent unit being used for military work is available from Trad Electronic Corp.

The unit was designed to furnish all necessary performance measurements on transmitting and receiving equipment in the 190-kc to 400-mc range. Instrument consists of two rf signal generators and a multi-range 20,000 ohm/volt dc or 5000 ohm/volt ac meter for monitoring transmitter performance.

Circle No. 52 on Reader Service Card.

Teflon hose assemblies

Flex-O-Tube Division of Flexonics Corp. has introduced a line of Teflon hose assemblies constructed of smooth, extruded Teflon tube with stainless steel wire braided covering.

The hose is designed to withstand working pressures up to 3,000 psi under certain temperatures and will withstand temperatures up to 500°F when working pressures are not above 1,000 psi.

Teflon retains its inherent high flexibility over a broad range of conditions, resisting chemicals, oils, and corrosives at elevated temperatures. This makes the hose ideal for handling chemical elements and compounds, gases and vapors, jet fuels and other substances that cause other hose materials to deteriorate.

Circle No. 68 on Reader Service Card.

Dimpling machine

The Lemert Engineering Co., Inc. has introduced a dimpling machine designed to keep pace with modern high-temperature alloys. It is being manufactured in a floor series, Model C-125, to handle not only the softer alloys but the new 17-7 PH and 15-7 Mo. stainless steels as well as vanadium and manganese alloys of titanium.

The Airflex Camtrol method does not use heat as associated with ram type dimpling. It differs from cold performance in that it uses high-frequency impacts plus spinning to reform delicate metal structures rapidly and yet by the minute radial stages to prevent shearing.

Airflex "Cold Flow" combines these twin actions under precision controls for force of impact, blows per minute, dimpling time and die hold-down pressures to keep the operation within each alloy's stress factor.

Circle No. 26 on Reader Service Card.



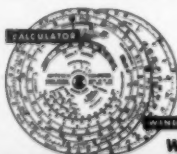
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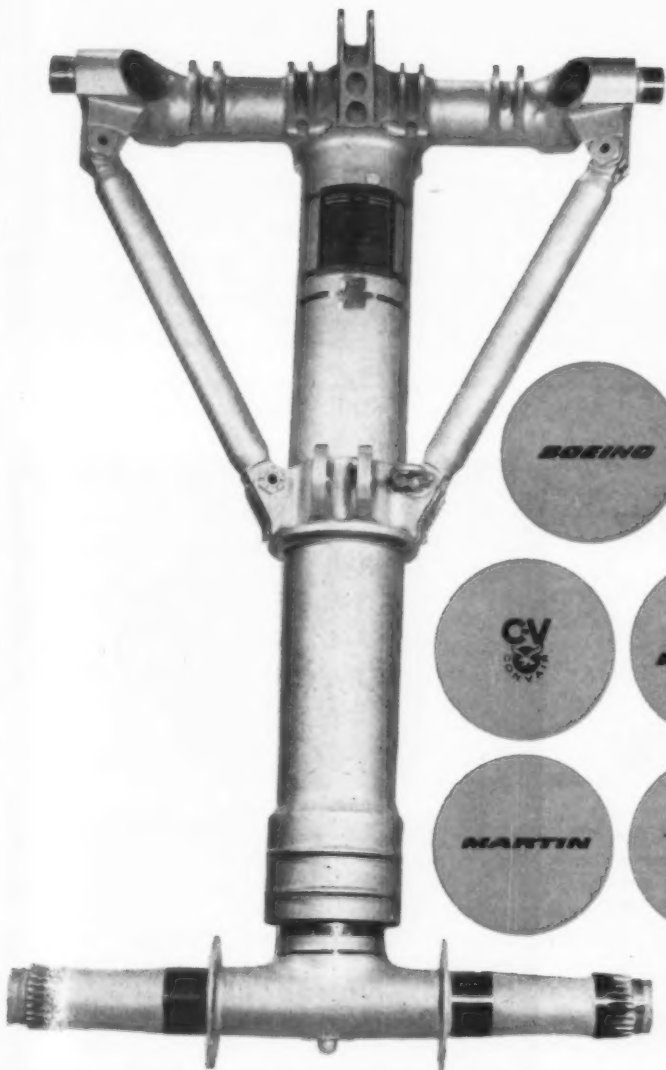
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BRIEFS

• **Joclin Manufacturing Co.** offers two new products, teflon-insulated connectors that are non-inflammable and a clamp, trade-named the Joclamp, that will withstand temperatures ranging from -300° to 500°F.

The connectors are said to be excellent for high-frequency coaxial service in radio, radar and other electronic equipment. The clamp is said to be impervious to hydraulic fluids, lubricating oils, corrosive fuels and solvents.

Circle No. 95 on Reader Service Card.

Oakite Products, Inc., has developed a new non-foaming cleaner that removes inks, grease, oils and other heavy soils from aluminum. The material, Cleaner No. 164, is specially compounded to clean without foaming in agitated tanks.

Circle No. 31 on Reader Service Card.

Airtemp Division of Chrysler Corporation has unveiled a new mobile aircraft conditioner/heater unit for terminal use which combines a 25-ton refrigeration system and a 200,000 BTU heating unit. The equipment is carried in a Dodge truck with a special Fruehauf body.

Circle No. 32 on Reader Service Card.

Auto-Air Industries, Inc. has developed a plastic metering device that pumps and delivers exact quantities of epoxy and polyester resins and hardeners for various applications, including aircraft plastic tooling. Material is fed to the dispenser from drums or containers through hoses.

Circle No. 72 on Reader Service Card.

Arkwin Industries, Inc. offers a series of semi-automatic bleeder valves for such applications as bleeding air from filter housings and reservoirs, purging air during refueling of fuel tanks, handling corrosive liquids and for high points of hydraulic systems. Available in either aluminum or stainless steel.

Circle No. 73 on Reader Service Card.

Aero Research Instrument Co. has introduced a total temperature probe, either boom- or strut-mounted, for use on missiles and operational aircraft. Available with a choice of resistance, thermistor, or thermocouple sensing elements. Literature available.

Circle No. 74 on Reader Service Card.

William Brand & Co. is producing a flat, multi-conductor cable, trade-named Turbo Ribbon Cable, said to be ideal for airframe and guided missile wiring. Color-coded conductors can be ripped apart and easily separated.

Circle No. 90 on Reader Service Card.

Kittell-Lacy, Inc. has developed test equipment for the generation of jet noise or its suppression. A typical simulator generates 151 db of noise in the range between 50 and 10,000 cycles per sec., through an opening approximately 8" x 8", into a free field condition. Sound source can be single sine wave or "white noise," or any variation between these two extremes.

Circle No. 91 on Reader Service Card.

The Russell Manufacturing Co. offers a woven material, trade-named Rusco, said to be resistant to temperatures ranging up to 2,000°F and therefore especially adaptable to rocket and missile parts insulation.

Circle No. 92 on Reader Service Card.

William G. Smith's "AN Aero Standard Selector" is a pocket-size drafting aid that eliminates the problem of hunting for information on bolts and nuts. Based on the sliding card-insert principle, it contains all information given in standards books, including dash numbers, tensile and shear strength, and operating instructions.

Circle No. 93 on Reader Service Card.

• **Whitney Blake Co.**, Electronic Division has introduced a self-locking hold-down clamp for use on electronic instrument assemblies in aircraft, said to eliminate the need for safety wiring.

Circle No. 71 on Reader Service Card.

ANOTHER ACHIEVEMENT

A resilient insert rack and panel connector

Here is the new and improved Bendix Type SR rack and panel electrical connector with outstanding resistance to vibration. The low engagement force of this connector gives it a decided advantage over existing connectors of this type.

Pressurization is easily accomplished. The resilient inserts press firmly against the shell wall holding the contacts in exact position. Insert patterns are available to mate with existing equipment in the field.

Adding to the efficiency of this rack and panel connector is the performance-proven Bendix "clip-type" closed entry socket.

Here, indeed, is another outstanding Bendix product that should be your first choice in rack and panel connectors.



OUTSTANDING FEATURES

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Now, the long-awaited aircraft loran, designed primarily to fill the needs of transoceanic flying and packaged for cockpit installation, is announced by EDO. Built specifically to meet airline requirements, this new lightweight unit is designed for instrument panel mounting, convenient to the pilot.

It's no longer necessary to pay a heavy weight penalty for the added safety and convenience of loran gear. Edo's new set weighs only 26 pounds completely installed.

Built to the highest electronic standards, the Edo Model 345 gives quick, directly read time difference readings for accurate plots in a matter of seconds. No calculation, no computations, no tables, no special training needed to operate. As simple to use as any other pilot-operated radio navigation aid.

A development of Edo's years of research, design and production of dependable marine loran sets and other high performance electronic equipment, the Model 345 contains the latest miniaturized circuitry. Its compact remote control console and clear, easily read 3-inch scope fit neatly into the restricted space of an airplane instrument panel.

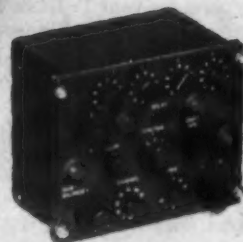
If you are interested in detailed specifications and operating data, please write for particulars.



Model 345

For Cockpit
Installation

26 Pounds
Total Weight



Compact scope and command control designed for cockpit installation. 34-tube receiver (not shown) occupies 3/4 ATR rack.

FEATURES OF THE EDO MODEL 345

- 3-inch scope easily read even under bright light conditions. Does not require a special hood. Can be mounted directly in instrument panel, or other accessible spot.
- Pilot-operated command control gives directly read solution to problem. No calculations, no tables, no special training needed to operate.
- Loran receiver containing 34 tubes. Features low power consumption — only 175 watts, 115 v 400 cycles; 25 watts, 24 v DC.
- No-drift signal assured by special oscillator control.
- Highly accurate voltage regulation for dependable operation.
- Complete fail-safe feature.

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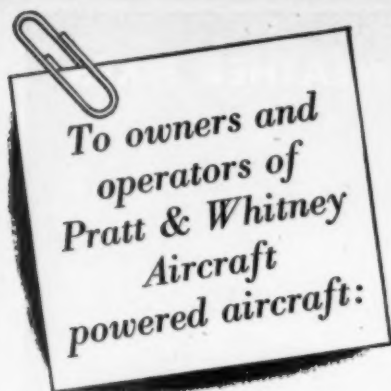


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WEST COAST TALK

by Fred S. Hunter

Douglas, Navy in final salute to AD. Pacific Airmotive comeback.

DOUGLAS and the Navy made a ceremony of the last AD delivery the other day. Decided they were entitled to display a little sentiment over the termination of 12 years of continuous production of one of the finest airplanes the Navy ever had. This final AD-7 was also the last propeller plane for the Douglas-El Segundo division. All jets henceforth. "Now I understand how Henry Ford must have felt about the last Model T," wistfully observed T. E. Springer, v. p. and gen. mgr. of the El Segundo division.

One of United Air Lines' New York-Los Angeles nonstops is designated Flight 707. That's a number we'll bet they change.

Our nomination for the most spectacular management job of the year in this section—the transformation of Pacific Airmotive Corp. from deep in the red in fiscal 1955 to a fat \$921,420 net profit in 1956. That's the equivalent of \$1.40 per share. The market price of the stock itself wasn't much more than that when John W. Myers and B. Allison Gillies began calling the signals at PAC.

Rumors persist that both the Boeing and Douglas small jets are farther away than ever. Big problems: engines, tight money.

Budget shortages are rough on Douglas. First, the Navy terminated the El Segundo division's F5D-1 because of the lack of funds. Now the Air Force is talking of dropping the C-132 for the same reason. Douglas transferred some of its best people from Santa Monica when the Air Force ordered the big turboprop transport project shifted to Tulsa. They sold their homes, cut old ties and made various other personal sacrifices to make the move to Oklahoma and help on the aircraft Douglas expected to become a key unit in the logistics of the Air Force. Termination of the C-132 will mean they'll have to be uprooted again.

They make their own rain out at North American Aviation. Some tests on operation of the F-100 in rain were scheduled. So they borrowed a tanker from the Air Force and filled it with water. Then they flew the F-100 through the spray of water discharged

from the tanker. Very simple. Also safe. This way, they flew the rain tests on a bright, sunshiny day at El Centro, where there was little traffic and ceiling and visibility unlimited.

Curtiss-Wright, which just opened a \$4,000,000 engine overhaul facility in Burbank, is locating the test stands for engine runups in a remote location 20 miles out in the country. It will be cheaper to transport the engines back and forth than to build sound suppressors capable of doing the job in this close-in area.

Lockheed's F-104 production will peak at a slightly later date and carry into 1959 as result of an Air Force slow-down on rate of production on the supersonic fighter. Overall quantity is unaffected. Slow-down will enable Lockheed to accomplish fixes for improvements in the flashy performer.

Republic's F-105 is the latest airplane said to have been stepped up to Mach 2 in a test flight at Edwards, but it is also said to have lost some altitude along the way so it wasn't in straight and level flight . . . J. L. Atwood, president of North American, told stockholders at the annual meeting that the F-107 is faster than the F8U, current holder of the official NAA speed record.

Convair will use Scotchweld bonded integral wing fuel tanks to carry the 70,000 pounds of fuel in the 880 jet airliner. Convair's F-102As interceptors incorporate integral wing tanks sealed with Scotchweld thermosetting structural adhesive. No fuel leaks have developed in more than two years of flight operation.

"Jetstream Starliner," TWA's name for its Lockheed Model 1649As, is proprietary and Lockheed's name for the airplane will simply be "Starliner." They're both good, but we still think Lockheed's original name of "Super Star Constellation" was better because it kept the Constellation identification.

California has 12% of the nation's aircraft, and 12% of the pilots, but only 6% of the airports, and Clyde Barnett, state director of aeronautics, won't be happy until the ratio is in line. Barney's doing a good job in this post.

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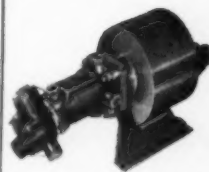
Vickers Thermal Operated Relief Valves protect the primary and secondary hydraulic systems from overheating by automatically depressurizing the circuit at a preset temperature.



Vickers 3000 psi Variable Displacement Piston Type Pumps supply power to the primary and secondary hydraulic systems on the Convair F-102A Interceptor.



Vickers 3000 psi Constant Displacement Piston Type Pump operated by ram air turbine supplies both emergency hydraulic and electric power through the constant speed motor driven alternator in event of engine failure.



Vickers Constant Speed Hydraulic Motor drives the emergency alternator from either the ram air turbine or the secondary hydraulic system.

The Convair F-102A all-weather supersonic stratospheric interceptor depends on Vickers Hydraulics for the following important functions:

- Primary and secondary hydraulic systems
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- Emergency electrical system

The components shown here were selected by Convair for their outstanding dependability and the additional advantages they offer in superior performance. Their technological advancement keeps pace with aircraft development. The pumps are characterized by minimum heat rejection and highest overall efficiency . . . all units shown have small size and light weight. For further information, ask nearest office listed below for Bulletins A-5200-D and A-5209.

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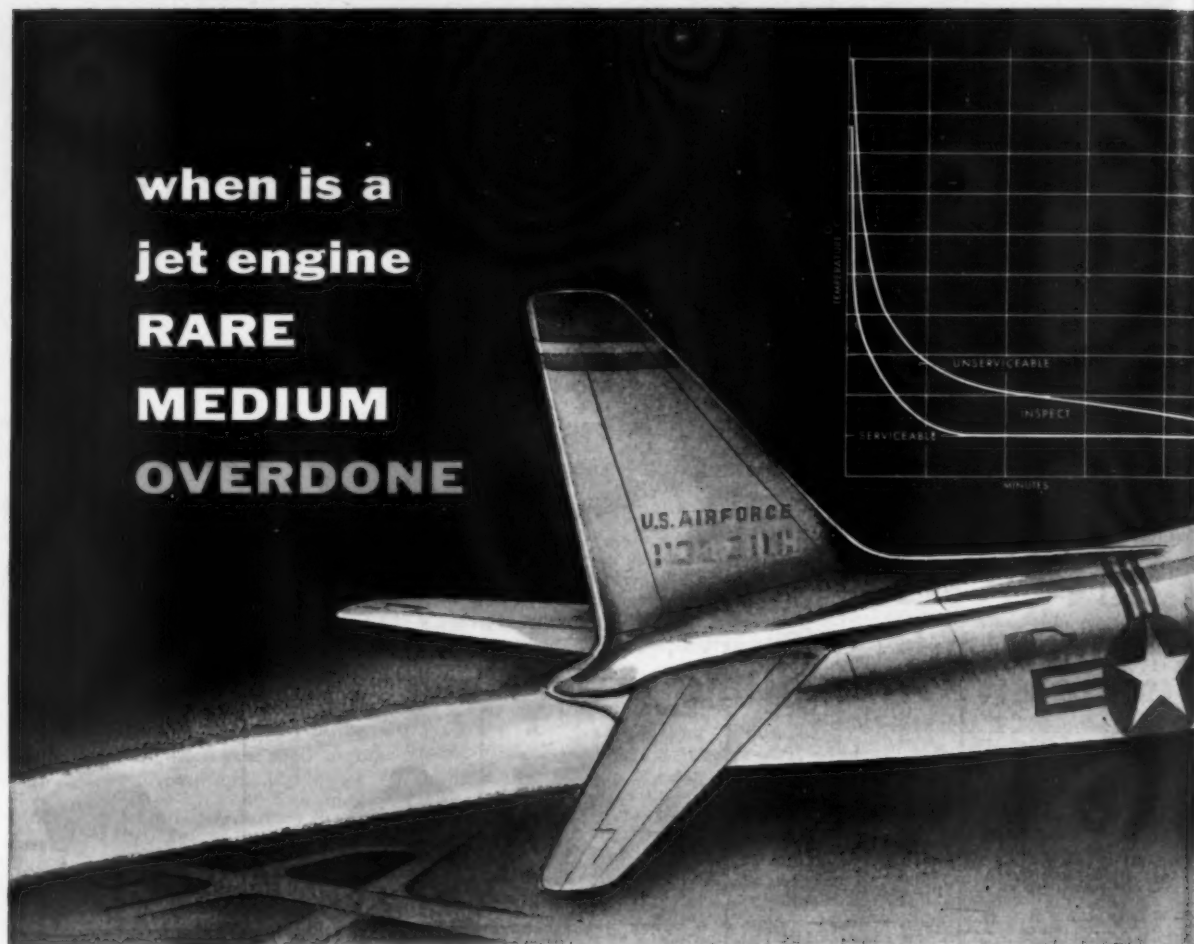
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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921
MARCH 11, 1967

Circle No. 18 on Reader Service Card.

79

when is a jet engine RARE MEDIUM OVERDONE



AVIEN'S TTR keeps hot jets "hot"... and safe

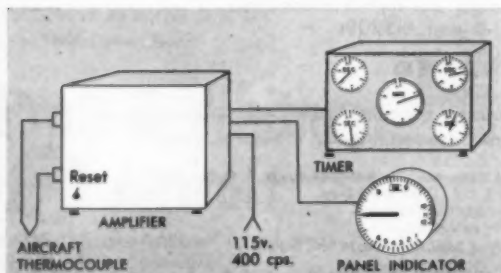
You may be able to plot a jet engine's overheat limits accurately enough on paper... but what actually happens in flight? When is the serviceability range exceeded? When does overhaul... or replacement... become a must? The wrong answers can mean a lost engine, plane... and crew.

Getting the right answers every time is the job of TTR... Avien's Time-Temperature Recorder for jet engines. Providing both panel indication of operating temperature, plus a visual record of engine overheat time, it tells pilot... and ground crew... exactly when engines approach the dangerous "overdone" region. The result is improved flight safety at high thrust operation, plus simplified maintenance and reduced aircraft down time.

A product of Avien's unsurpassed experience in designing and manufacturing engine temperature instrumenta-

tion for high performance aircraft, the TTR system is equally applicable to turbo-jet and turbo-prop engines. Employing Avien's servo-driven, self-balancing gaging design, it monitors critical temperatures within $\pm 0.5\%$, detects and logs as little as one second of overheat. Designed to meet the specialized requirements of today's... and tomorrow's... aircraft, it can monitor a single temperature limit, a multiple group, or any range of engine temperatures.

Now specified by the USAF for all F86D "Sabrejets," the TTR system brings to both military and commercial flight a precision tool for resolving the conflicting requirements of high efficiency and maximum flight safety. Perhaps it can help you solve a tough engine temperature problem. For more information, write Sales Engineering Department.



Typical TTR (Time-Temperature Recorder) for jet fighter records length of time engine has exceeded any one, or any combination, of five critical temperatures. Using existing aircraft thermocouple harness, the system requires neither shielded leads nor special size wiring. Flag in indicator warns pilot when overheat temperature has been reached. Flag re-set is located in amplifier and is accessible only to ground crew. Overheat warning remains in "danger" position until engine has been inspected for possible turbine-wheel damage.

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PRECISION INSTRUMENTS AND CONTROL SYSTEMS
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by Anthony Vandyk

Break near on U.S., Mexico pact

Can it really be that an airtransport agreement is about to be signed between the United States and Mexico? All indications are that a "break" in the situation is at hand. If this is so, passengers will have a choice of carriers if they want to fly nonstop to Mexico City from New York or Los Angeles.

At the moment, the only carriers providing nonstop service between New York and Mexico City and Los Angeles and the Mexican capital are Air France and Compania Mexicana de Aviacion (CMA), respectively.

No U.S. carrier flies from the West Coast to Mexico City although Western Air Lines has held a CAB permit to operate the route for over ten years. On the route from New

York to Mexico City, American Airlines provides a service with several stops. The Mexicans have refused hitherto to let Western compete with CMA or to allow American to operate nonstop from New York to Mexico City.

Communications between the southern U.S. and Mexico City are also in bad shape. The only carrier flying from Miami to Mexico City is Guest Aerovias Mexico while service from Houston to Mexico City is in the hands of Pan American World Airways. From Dallas/Ft. Worth and San Antonio, American Airlines has the monopoly.

This unsatisfactory situation under which certain airlines monopolize certain routes and no U.S. carrier is

permitted to operate nonstop on the two most important routes seems likely to end for several reasons.

One is that Californian interests have been putting the heat on the U.S. government to suspend or revoke CMA's Los Angeles terminal rights until Mexico grants reciprocal L.A.-Mexico City rights to a U.S. carrier. The second reason is that CMA is about to receive a fleet of DC-7Cs which cannot be fully utilized unless the carrier is permitted to operate between Mexico City and New York.

It is, however, by no means certain that CMA will be designated by the Mexican government to operate the New York route. Both Guest and Aeronaves de Mexico are making strong pitches to be given the route. Guest already serves the U.S. (Miami) and also operates to Windsor, Ontario, across the border from Detroit. Aeronaves, on the other hand has no present U.S. terminal although it operates to Tijuana across the border from San Diego.

Aeronaves has contracted to buy three Bristol Britannias and recently started operating two Constellations on the Mexico City-Tijuana route supplementing its Convair 340s and DC-4s.

Aeronaves also seems to have formed a close association with the Bristol company by purchasing a 20% interest in Bristol de Mexico. This is the engine overhaul facility established in Mexico City by the Bristol Aeroplane Co. of Canada, which itself is a subsidiary of the British Bristol Company.

Bristol's shops will start operations in May and initially will overhaul ten engines a month for Aeronaves. The airline plans eventually to have all its engines overhauled by Bristol de Mexico.



SNCA DU NORD'S GRIFFON 2 experimental delta prototype is reported to be supersonic. It will ultimately use mixed propulsion—a ramjet supplementing its SNECMA Atar turbojet.

BRIEFS

HOAC plans to introduce Britannias on the London-Tokyo route in June . . . LAL is considering buying the Boeing 707-420. Total Italian state-backed credits available for commercial transport purchases by Italian airlines amount to \$50 million . . . South African Airways will start operations to Amsterdam in April . . . Czechoslovakia's CSA will shortly extend its Prague-Berlin-Copenhagen service to Stockholm and Helsinki . . . Qantas Empire Airways expects tourist class fares to be cut by 20% when it introduces Boeing 707s on the Sydney-

London route in 1959, according to chief executive Cedric Turner . . . British European Airways' 19 Elizabethans are to be offered for sale this summer. They are being replaced with Viscount 800s. . . South African Airways will introduce two services a week between Johannesburg and London via the West Coast of Africa April 1. Three flights will be maintained over the traditional East Coast route . . . Aranya Airlines of Afghanistan is reported to be buying a small fleet of early-model Constellations to expand its international operations . . . Ghana, the new West African nation, may have its own airline. Hunting-Clan, British independent, is interested in participating in the operations of this carrier.

Bristol has built six prototype BE25 Orions to date and a seventh is currently being completed . . . Germany's Heinkel company plans to devote about half of its resources to aviation work. Agreements have been signed with Turbomeca and Fokker for the production of spare parts and for overhaul work . . . Aerfer of Italy has designed a transport featuring two RR tyne turboprops in pods atop of the wing . . . Imperial Chemical Industries, leading British titanium supplier, has reduced its raw metal price to a world low of \$2.73 per lb. Prices of wrought alloys and other products are cut by an average of 10%.

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now available in 12 major cities



American Airline's famous Mercury service, formerly available only on New York-Los Angeles nonstop flights, is now extended to include all the cities listed above. Mercury luxury means red carpet service at shipside, reserved seats, superb cuisine—all on the DC-7, world's fastest airliner—and all at no extra fare.

AMERICAN AIRLINES
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TRANSPORT AVIATION

by Anthony Vandyk

TCA sets pace in turbine transport

MONTREAL—It's a safe bet that when turbine-powered automobiles come on the market the first purchaser will be Gordon R. McGregor, President of Trans-Canada Air Lines, provided that his director of engineering, Jack Dymant, approves the model in question.

This would be in line with the pattern set during the last few years which has made TCA probably the world's most turbine-conscious airline. In fact, it doesn't make such a claim because McGregor and his associates are modest men. They would be the last to boast that:

- TCA was the first North American airline to put a turbine transport (the Viscount) into scheduled service.

- By "Americanizing" the Viscount design and by adopting the air-

fitted with two Rolls-Royce Avons to meet the airline's requirements but when this engine was not made available by the British government and four Derwents were substituted TCA lost interest.

The fuel consumption with four engines was too high for the available tankage and range became too small for the airline's important Toronto-Winnipeg route sector.

Nonetheless, TCA kept on preparing specifications and checking on available designs. In charge of these operations was Dymant, a man who knows what he wants and is not bashful about expressing his views.

It was Dymant who was chiefly responsible for TCA's decision to buy the Viscount and thus become the first North American operator to introduce

further orders of non-turbine-powered aircraft.

The plan was for TCA to be turbine-powered 100% by not later than 1961. So finally the DC-8 powered by the Rolls-Royce Conway bypass engine was selected and the order was announced last year. TCA was therefore committed from a long-range standpoint to the DC-8 jet and for short-range operations to the small Viscount.

To fill the gap between the DC-8 and the Viscount, the TCA planning staff, under Dymant's direction, went into a lengthy study. Looking at the type of mileage of its various routes, between what it believed at the time the DC-8 could do economically and what the Viscount was capable of doing, TCA thought that the aircraft it wanted for this intermediate type of operation should be at its maximum efficiency or economy in about the 500 miles range. Actually, the airline does not have many legs of 500 miles but the figure was an average of all sectors.

When TCA started to make its study, the aircraft considered were: Convair 880, Douglas DC-9, Lockheed Electra (with both the Allison 501 and the Rolls-Royce Tyne) Comet (3 and 4), Bristol Britannia (with the Proteus and the BE-25 Orion), Vickers "Trimotor" (a proposal that involved three Conway engines grouped in the rear portion of the fuselage), Vickers Vanguard and Sud-Est Caravelle.

TCA did not include the Boeing 727 because it already had looked at the bigger Boeing 707 and at that time Boeing hadn't really decided firmly to offer the 727. The smallest 707 would have been too big for the requirements of TCA for inter-city operation.

There were a lot of angles to study. For instance, if the Convair 880 seemed desirable it could do good service on different routes from those of, say, the Lockheed Electra. For example, the 880 has sufficient range to fly all operations in Canada west of Toronto. It could fly Toronto-Vancouver and Montreal to Calgary non-stop.

Therefore, when TCA was considering the 880 it had to take into account that purchase of the aircraft would mean fewer DC-8s would be required since the Convair could take care of all requirements west of Toronto. On the other hand, if an aircraft with shorter-range capability was taken, then DC-8s would have to be made available to operate the nonstop



THE VICKERS VANGUARD was selected for purchase as TCA's medium-sized turbine transport after close examination of the DC-9, Electra and other competitive models.

craft, TAC played a vital part in the aircraft's successful sales history.

- TCA was the first airline to order the Rolls-Royce Conway bypass engine (for its DC-8 fleet).

- It was the first airline outside the United Kingdom to order the Vickers Vanguard.

- It is likely to be the world's first major airline to have an all-turbine fleet. It plans to eliminate all its piston engine-aircraft by mid-1961.

TCA did not become turbine-conscious overnight. Ever since 1945 the airline has been studying all turbine aircraft designs. In fact it was in 1945 that TCA produced a detailed specification for a jet transport that resulted in the construction of the Avro-Canada 102. This aircraft was to have been

turboprop equipment. He put the heat on Vickers to "Americanize" the Viscount design. The British company, in fact, had to spend more engineering manhours on TCA's modifications for the turboprop aircraft than it had on the entire design of the Viscount up to the time TCA entered the picture.

After the decision to buy the Viscount, TCA had to decide on its next long-range type. A study was made including the Douglas DC-8, Boeing 707, de Havilland Comet, Bristol Britannia and Vickers V.1000, together with developed versions of the DC-7 (DC-7C) and the Lockheed L-1649 Super Constellation. Piston-engined aircraft were quickly eliminated because TCA had established a policy opposed to any

Toronto-Vancouver run. So all the aircraft considered by TCA in the study were to some extent interrelated.

Dymont comments: "You can no longer analyze one aircraft and another aircraft and another aircraft, and compare them as straight aircraft on some ATA basis or something like that. You must integrate what you're finding with your entire fleet because depending on the capabilities of the new aircraft, you determine the number of additional Viscounts or DC-8s that you might have to order.

Also, for instance, in the case of the Vanguard, because of the big belly, the capabilities of carrying cargo in the belly would mean that TCA would be able to go two or three years longer before it would have to buy additional cargo area. So that would have to be taken into account in the overall planning."

On the other hand when TCA was considering the DC-9, another factor entered the picture. Because of the similarity between the DC-8 and the DC-9 it was estimated that the company would save \$1-1.5 million in maintenance costs alone, because of the similarity between the two aircraft.

TCA had a few of what Dymont calls "private little prejudices." The airline was anxious to get rid of propellers and reduction gearing. It considered that if a purejet would do the job economically, so much the better.

Furthermore, TCA realized that if it ordered turboprops there was always the probability someone would come along with something a little bit faster. By purchasing the DC-9, Convair 880 or some other jet, TCA would have been virtually guaranteed that no one was likely to operate a competitive aircraft with any great speed advantage.

TCA therefore liked the idea of buying a jet. In its initial studies, the DC-9 looked good. One advantage, TCA felt, was the background of Douglas. The airline had a very high regard for Douglas because of its unrivaled experience as a transport builder.

Although the DC-9 looked good initially, when TCA took into account its traffic density and traffic distribution, the picture became entirely different. Up to that time, the airline had been merely looking at the aircraft from the standpoints of the payload capacity and range characteristics. In these respects the DC-9 looked good.

But when TCA analyzed its point-to-point traffic estimates for the future, it found the jet would not operate economically on really short runs; it would have to be backed up by many more Viscounts. This would have entailed up to 30 Viscount frequencies a day on certain routes—a tremendous handicap from a traffic-control point of view, from a ramp-handling standpoint, and even from the public standpoint.

TCA decided it would be much more desirable to have a bigger aircraft in service on the routes where the den-



FIRST OF TCA's turbine transports is the Viscount, which has been in service for nearly two years. Ultimately the airline will have a fleet of almost 50 of these aircraft.

sity of traffic is high. It all boiled down to the fact that when the volume of traffic on short ranges is considered, TCA wanted not an aircraft that would operate economically at 550 miles, but at 380 miles. The company found that 50% of its traffic demand was below 380-mile route sectors and 50% above.

A look at a curve of cost against range and distance shows the cost curve increases very rapidly at short distances. This gradually increases more steeply as the short range is approached. Therefore, the cost of operating the average of the 50% below 380 miles would be much higher than the average of the 50% above. This really meant that TCA needed aircraft to operate economically around 300-mile stages.

As soon as TCA started to examine possible aircraft that would carry large numbers of passengers for distances of only 300 to 380 miles, the jet went out of the picture. Down to 700 miles the jet could do the job very well beating any other type of aircraft. Even for a 500-mile range it could do a very adequate job and could be quite competitive with all aircraft except one or two of the turboprops.

But down in the neighborhood of below 380 or 300 miles there was no jet that would touch the better turboprop aircraft for economy. Therefore, TCA reluctantly returned to the turboprop for simple reasons of economy.

Of all the turboprops the one that turned out to be the most economical was the Vickers Vanguard. That was for several major reasons. Firstly, the Lockheed Electra, notwithstanding the low guaranteed overhaul cost figures quoted by General Motors for the Allison engine, is still an expensive airplane in that it is small. TCA believes that basically the bigger the airplane the cheaper it will be. And that's where the Vanguard came in.

The Electra, TCA's studies showed, can take about 87 passengers while the Vanguard with 6-abreast

seating accommodates 120. This makes a very large difference in direct operating costs.

The Vanguard had another feature which was very attractive to TCA. On the airlines intercity runs now operated by Viscounts, by the time the full load of passengers and their baggage are put into the aircraft, there is no space left for mail. Quite often TCA has flights where mail is delayed because there is no room for it. This naturally does not please the Canadian postal authorities. When the mail reaches the airport they want it to go out on the very first flight.

TCA can always get it out on the second flight but the postal people want it to go on the first flight every time. This is a handicap with a smaller aircraft but the very large "double bubble" fuselage of the Vanguard provides a special belly suitable for taking care of the mail problem.

TCA has another observation in connection with intercity aircraft. It notes that the public does not like to travel between midnight and 7 in the morning. In other words for about eight hours of the day, the public travels only when it absolutely has to. Although these eight hours could be used for maintenance and overhaul work, TCA does not consider this good practice because it has found there is a big reduction in efficiency among people working on the night shift. Therefore, TCA considers, to all intents and purposes, those eight hours are almost lost on intercity runs.

If something can be done to let the aircraft work during the time when people don't want to travel, it is an excellent thing for the airline. And that is what the Vanguard's big belly makes possible. It enables the operator to carry almost the entire payload of the aircraft in the belly when no passengers are transported in the upper section of the "double-bubble." The Vanguard has tremendous flexibility in enabling a full payload to be carried either in the

belly or in the passenger cabin or in a combination of the two.

By taking advantage of this feature TCA can work the aircraft at night and thus get maximum utilization. As an example, the Vanguard can be flown across the continent at a bad hour, or between major cities in the eastern division carrying cargo, and then come back as passenger aircraft first thing in the morning.

TCA, of course, has a specialized one-way freight problem. Unlike the U.S. where there are millions of people on the Pacific coast, millions on the Atlantic coast, millions in Chicago and millions in the Miami area with consequent good trade between them, in Canada things are different. Here all the millions are between Windsor and Quebec. Fruit may go out of the Okanagan Valley in the west and nothing comes back. For Canada, and therefore TCA, cargo is very directional. Therefore the Vanguard's flexibility is of particular importance to TCA.

During TCA's studies the airline discovered that the DC-8 would operate down to relatively very short ranges, very economically if it could be filled. So it became apparent that with the combination of the Viscount, Vanguard and DC-8, the DC-8 could move down into the Vanguard field as traffic builds up in the future. Furthermore, the Vanguard could move down into the Viscount field as traffic built up there. The three types of aircraft seemed to TCA to be very compatible with each other in doing the job.

Of course, speedwise the Vanguard cannot compete with a DC-8 on a longer flight within Canada. However, on such key routes as Toronto-Chicago or Toronto-New York it would be only about 15 minutes slower. TCA feels that in return for the

additional 15 minutes it will have a much cheaper operation than any one who is willing to try to put a DC-8 on the route and therefore will enable lower fares to be offered.

In studying the relative merits of the Vanguard and the Electra TCA's studies show clearly that the Electra is up to 40 mph faster. The airline considers that the Lockheed turboprop model would be a good aircraft for certain types of operation. In fact the entire TCA study revealed very clearly that no one type of aircraft should be described as better than any other. However, for TCA's conditions, the Vanguard seemed better than the Electra. For another carrier, TCA admits, the Electra might have the edge over the Vanguard.

How about other aircraft that TCA has looked at? Like the Electra, the airline rates the DC-9 and Convair 800 "very good airplanes." The Britannia, TCA feels, has missed the boat from the timing standpoint. If it had been ready with most of the bugs out a year or two ago it would have sold in large quantities although it would not have been suitable for TCA's requirements.

The Comet? Right at the beginning TCA felt that the de Havilland jet had certain deficiencies and therefore did not order it. Today it believes that the Comet 4 is basically too old a design—its wing design is some ten years old.

In the course of keeping a tab on new designs Dyment and his team are continuously visiting plants on both sides of the Atlantic. He believes that basically the British can produce transports considerably more cheaply than can the U.S.

The main reason for this is that the British industry does not tool up as

elaborately as the American industry because until the Viscount it has not had any really big production runs for transport aircraft. As an operator, Dyment points out that all TCA is interested in is the accuracy of the tooling to insure that there is interchangeability of components.

"If the Vickers tooling, for instance, should fall apart before they produced more than 300 aircraft, we couldn't care less," he comments bluntly. "In the U.S. on the other hand, there is a tendency to insure that tools hold together for long production runs. These tools are more costly and in the end the customer pays. Most U.S. manufacturers also deal in big military orders so they are production-minded in a big way. Their entire organization for handling drawings and making changes is very much more complicated than the British manufacturers."

TCA estimates that it can make a change in a Vickers aircraft for about one third of the cost that would be involved in making the same change in an American aircraft. This is merely because the overhead involved and the paper work involved in making a change in Britain is less.

Dyment thinks that U.S. firms in commercial operations are handicapped because of their military high-production thinking, which affects the civil side. In other words, a penalty is exacted if the purchaser wishes to make a change. The British, on the other hand, without big military contracts, have less difficulty in meeting the individual requirements of small customers.

TCA insists that its aircraft procurement policy is neither pro-British nor anti-American. Provided that Dyment gives the nod, it will buy anywhere.

Pacific Airmotive plans overhaul of jets

Discussions concerning future J57 and J75 engine overhaul work are being conducted by Pacific Airmotive Corp. with several of the airlines that have ordered Boeing and Douglas jet transports.

PAC plans installation of new jet engine test cells to be in operation by the time the jet transports go into service. Stands will be at PAC's Chino, Calif., facility rather than at Burbank where piston-engine test stands are located.

Burbank presently has facilities to test J57 accessories but additions are required for complete jet-engine overhaul. PAC is the only private maintenance facility on the West Coast already servicing J57 and J75 engines. More than 200 J57s and accessories have been handled over the past two years and half a dozen J75s have been serviced recently. All work was done at Burbank.



FIRST OF TCA's jet fleet will be the Douglas DC-8. The Canadian airline has selected the Rolls-Royce Conway to power its version of the Douglas transport.

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CAL to provide plush Chicago-L.A. aircoach service

New "gimmicks" to promote sales and develop travel will be introduced by Continental Air Lines when it starts DC-7B "Continental Club Coach" service April 28 on its new Chicago-Denver-Los Angeles route.

Among the innovations will be:

Pre-flight selection of hot meals from "Country Club Chef" menus. There will be four meal choices, ranging in price from \$1.25 to \$2.50.

Liquor service—the first time on a domestic coach. Drinks will sell for \$1. Beer will also be available.

A "stag smoker lounge" in the forward part of the plane, where men can smoke pipes and cigars.

A five-seat observation lounge in the rear.

Check-in counter greeting by flight hostess to facilitate in-flight service.

"Kid gloves" baggage handling.

"Step saver" coach service from airport terminal to planeside at Chicago.

CAL will begin service with two roundtrips daily, except Sunday. Kansas City will be added to the schedules in July. The company says it will be the first airline to offer an all-coach service for all scheduled flights on a major route.

President Robert F. Six said CAL is "facing up to the fact that today's coach service is far superior to yesterday's deluxe service, that the bulk of the traveling public is choosing it."

Meal Tickets and Liquor

In connection with the meal service, all CAL city ticket offices will display color photographs of the hot dishes, as well as the menus, and will sell meal tickets. Coffee, tea and milk will be furnished free. Drinks available for sale will include bourbon, scotch, cocktails, beer and soft drinks.

When passengers check in at airport counters, one of the two flight hostesses will be on hand to meet them. She will answer questions about the service and if any of the passengers has special needs, the information will be relayed via walkie-talkie to the hostess on board the plane.

The "kid glove" baggage handling involves use of special carpet-covered carts designed to hold luggage damage to a minimum.

At Chicago, after checking in at CAL's airport ticket counter, passengers will board a "step saver" coach that will transport them to the plane. The company's gate will be some distance from the terminal at Midway Airport. The coaches will have "airline interiors" and will be air-conditioned.

To load and unload passengers at Chicago, CAL will use canopied boarding steps with gold anodized threads. In Los Angeles, Denver and Kansas City, passengers will walk over a gold-covered carpet and use the same type steps.

All seats will be reserved on the 84-place coaches. To take care of babies and small children, hostesses will have baby kits, disposable bassinets, bottle coolers and baby chairs.

CAB members impressed with Fairchild F-27

Fairchild Engine & Airplane Corp. has firm orders for more than 60 F-27 turboprop transports, it was announced following a visit by CAB members to Hagerstown, Md.

CAB said Board members were told that the company had the orders Feb. 15 or before. This was the date when the \$50,000 price increase in the F-27 was to take effect.

A Fairchild spokesman corroborated the CAB statement but declined to give the exact number of aircraft on order. Last reported totals were 44 firm orders and 29 options. The spokesman said the number of aircraft on options remains at 29 despite the additional firm orders.

The CAB members returned from their visit to Fairchild with warm praise for the F-27.

"We have seen in the F-27 an aircraft which has been thoroughly developed. Deliveries to carriers are scheduled to begin in the next year. One advantage of it, from my observation, will be its ability to get in and out of airports smaller than those which are now being used by aircraft of the F-27's size and speed," said Chairman James R. Durfee.

The Board's visit to Fairchild follows similar ones to Boeing, Lockheed, Douglas and Convair last fall. A staff of 21 CAB personnel made the Hagerstown tour.

RCAF chief reveals details of CF-105

The first official information on Avro Canada's CF-105, now named the Avro Arrow, has been given by Air Marshal Roy Slemon, RCAF Chief of Air Staff. He described the CF-105 as: three times as fast as the CF-100 (which would put the new delta-wing in the 1,600-mile-an-hour class); about 34 tons in weight; ceiling about 12 miles, attained in three to four minutes.

The Chief of Air Staff added that the CF-105 would fly this year. The prototype CF-105s will be powered by Pratt & Whitney J75s, with the later production models getting the new Iroquois which Orenda Engines expects to test-fly this year.

DATA

ON THE NEW LEAR

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POWER OUTPUT: 3 watts max.; 1.2 watts undistorted.
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WEIGHT: Tuner, amplifier, loop, indicator—total 17.3 lbs.
TUNER DIMENSIONS: Lgth 8 3/4"; width 6 3/4"; hgt 2 7/8".

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LEAR

Locals clash on what they need

New planes, increased fares and a higher return on investment won't help the local service airline industry reduce or eliminate its subsidy needs unless the Civil Aeronautics Board removes some of the "artificial restrictions" on the locals' operations, C. A. Myhre, president of Frontier Airlines, has claimed.

"Serious disagreement" with some of Myhre's comments was immediately registered by Robert Peach, president of Mohawk Airlines, who said he believes there are "many opportunities available today to further reduce . . . subsidy requirements other than terminal-to-terminal route authority."

Myhre, in a speech before the Grand Junction, Colo., Chamber of Commerce, said the locals "require subsidy today primarily because they are required by Board order (not by traffic or economic reasons) to operate under such conditions and limitations that they cannot operate economically . . ."

"There is only one solution and that is to treat us as if we were *airlines* and to start relaxing the artificial restrictions . . . These restrictions are the heart of the problem—today we must stop every flight at every point on the route with minor exceptions . . ."

Three Specific Proposals

"In order to get some action started, we have three specific proposals (I am using Frontier as an example; similar situations apply to all other local carriers):

"1. After Frontier has provided two daily roundtrips to intermediate cities, allow us to operate without restriction between any two cities where competitive air service is not available . . . If the CAB were to take this action today with respect to *only* two segments on Frontier's present system, our subsidy needs for the next year would be reduced by a minimum of over \$700,000, or by nearly 30%.

"2. The CAB should declare a moratorium on proceedings involving trunkline applications for service between terminals served by Frontier. This would mean that while the Board is studying the problem of reducing subsidy, the potentially lucrative routes in the area . . . would not be awarded to an already prosperous trunk carrier . . ."

"3. The Board should institute an investigation to determine whether, after providing required local service, Frontier could operate without restriction between all cities it is authorized to serve . . ."

CAB, he said, "appears to have had some difficulty with authorizing local carriers to serve profitable route segments. The Board's past policy has been to eliminate local carriers as applicants from profitable route cases . . ."

Indeed, it has been regularly suggested by the trunk carriers that the true or real distinction between a 'local service' and a 'trunkline' route is whether it can be profitably operated . . .

"The thrust of my thesis is not that we abandon the service we were designed to perform, but rather that in addition, we be permitted to operate profitable routes, the profit from which can be used to offset the losses on the short-haul routes."

Calls CAB Estimate Low

Myhre said CAB's \$29-million estimate of the local lines' 1958 subsidy is low, and that, in his opinion, it may approach \$40 million. Even after \$24-million subsidy last year, the locals had a \$660,000 operating loss, and after 10 years' operation the industry had a \$327,000 deficit in the earned surplus account.

"We fear that unless we show progress toward reducing our subsidy requirements, the Congress may not indefinitely foot the bill; in a sense, therefore, I'm suggesting that the very existence of the local service airlines is at stake."

A "typical" local line represents a \$500,000 investment, has annual revenue of about \$3 million—which is \$2 million less than its expenses—operates with 45% load factor, has average distance between stops of 85 miles, and has costs per revenue ton-mile of \$1.10, he said.

Even if CAB should allow the locals a 12% return on investment instead of the present 8%, this typical carrier would realize only \$20,000 (4% of \$500,000 investment), he added. Also, if fares were raised 6%, it would get only 6% of the available annual revenue of \$3 million, provided traffic didn't drop off because of the increase. "Past experience indicates that a decrease would result . . ."

Peach disagreed with Myhre's use of a "typical" local line. "Each carrier must be viewed in the light of its route structure, area service and numerous other factors," he said, adding that Mohawk's experience indicates that an increase in its passenger fares today would not result in a traffic decrease.

Myhre also claimed that none of the three carriers that has tried newer airplanes (Mohawk, Allegheny and Southwest) has been able to reduce its subsidy needs. "The operating results of the three carriers . . . operating . . . Martins and Convairs demonstrates that the shortness of haul made necessary by certificate restrictions . . . results in significantly higher direct expense per ton-mile in two cases and virtually no improvement . . . in the third case. Furthermore, the depreciation expense per ton-mile on the new

equipment is so much higher than the comparable expense for DC-3 equipment that any operating efficiency is more than offset."

Convair vs. DC-3 Costs

Peach, however, said Mohawk's Convair equipment "has contributed more to indirect costs than has its DC-3 equipment. The increased direct costs, including depreciation . . . has been more than offset by increased commercial revenues attracted by this equipment. Load factors on both Convair and DC-3 equipment have remained substantially identical with the highest load factor ever produced on the Mohawk system with DC-3 equipment only."

He said further that Mohawk doesn't request a moratorium on trunkline route proceedings in its area. Company forecasts "do not indicate that its subsidy requirements will increase, but rather indicate reductions and gradual elimination of subsidy as the result of its re-equipment program . . . recent route authorizations . . . and route applications involving new services and greater skip-stop authority between its terminals, now being heard by the Board in two area local service cases."

Myhre revealed that FAL has made an analysis of the costs and traffic characteristics for a five-year period for a number of local service lines and regional trunks. "We have computed statistically what everyone in the industry has taken as axiomatic: that unit costs sharply decline as load factor and length of haul increases . . ."

"Our study shows that if the average hop of our typical airline increased from 85 miles to 100 miles (and if . . . the volume of traffic remained constant), costs would decline by approximately \$500,000. Moreover, if the average hop increased to 120 miles, costs would decline by \$1,000,000 . . ."

"The DC-3 can be operated at its maximum efficiency at hops of approximately 125 miles; the Convair . . . achieves its maximum efficiency on hops of approximately 200 miles . . . The problem has been, and is today, that no economies will result from operating a modern airplane on flights which are too short for even a DC-3."

Eastern Orders Electronic Simulators

Eastern Air Lines has joined the growing list of carriers swinging to electronic flight simulators for pilot training in the jet age.

EAL placed orders with Link Aviation, Inc. of Binghamton, N.Y. for two units—one for Douglas DC-8 jets and another for Lockheed Electra turboprops it will operate. Delivery is slated for early in 1959, several months before Eastern will receive its first jet.

CAB extends deadline for flight-test rules

CAB has extended until April 15 the effective date of new flight-testing rules following a one-day shutdown of test flights on the West Coast Feb. 20.

The new rules, which confine such testing to areas approved by CAA, went into effect on that day in the absence of agreement among aircraft manufacturers, CAA and military services as to where tests could be conducted.

According to Washington CAA officials, only two requests had been received from industry during ten days of continuous meeting after adoption of the new rule by CAB Feb. 5. One sought approval for testing throughout the Fourth CAA region except where restricted by CAA; another asked for 100 miles north and south of Los Angeles and eastward to the Colorado River.

CAA officials said they were forced to deny both requests. When negotiations virtually came to a halt,

Aircraft Industries Assn. asked CAB to act on the extended deadline and to reword the rule to place responsibility on CAA for designation of authorized test areas.

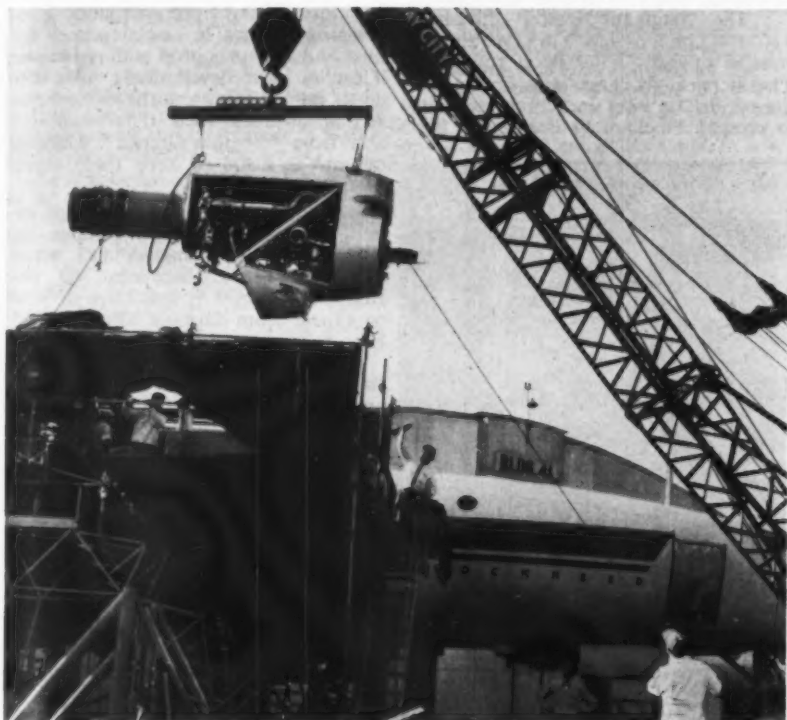
Almost concurrent with the Board's action, however, Air Materiel Command came up with a plan to be used by manufacturers for flight-testing of all aircraft under its jurisdiction. The AMC proposal, already approved by CAA, calls for two test areas—one extending seaward and another inland.

Inland area accepted tentatively

The inland area, reportedly extending into airspace now reserved by other military agencies, has been accepted by CAA subject to clearance by AMC of its new assignment with other military activities.

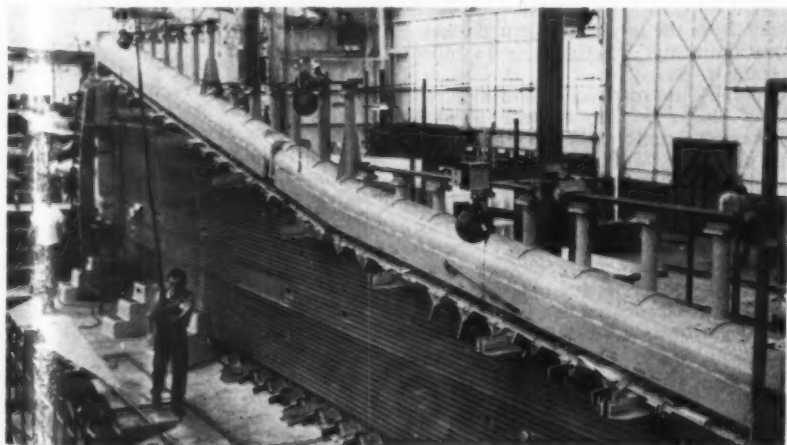
If adopted, the new area allocation will eliminate the better part of some 23 small test areas spotted along the west coast. It also promises to eliminate a major objection by manufacturers to the previous space restrictions faced in testing newer, high-speed aircraft.

Most troublesome problem faced in the past, according to CAA, is a requirement that calls for operation at cruise speed in straight flight for five minutes. This, CAA said, demands an area extending more than 100 miles for supersonic fighters and interceptors.



Engine test, wing work mark Electra progress

POWERPLANTS FOR LOCKHEED Electra turboprop will be used for first time in flight with Aeroproducts 606 four-blade hollow steel prop in a Constellation flying laboratory. First of the engines—Allison 501 D-13—is lowered into position on the testbed (above). (Below)—Integrally-stiffened wing skin of Electra nears completion. Section measures 42 ft. long. Wing-span is 99 ft., fuselage length 104½ ft., maximum takeoff weight 113,000 lbs.



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Jet vs. turboprop controversy

Lord Douglas urges independent study to resolve argument

by James Hay Stevens

LONDON—The airlines might do well to commission a thorough examination of the jet vs. turboprop controversy by an independent agency, Lord Douglas of Kirtleside said in his Brancher Memorial Lecture to the British Institute of Transport.

Crystallization of the controversy rests upon two main factors: (1) the jetliner is 100/150 mph faster than the contemporary turboprop, and (2) the

runway length: at full load, in hot weather, the big (American) jets will require 12,000 ft. for Atlantic operation, 10,000 ft. on shorter stages, with pavement strengths to take 150 tons.

The long-haul Bristol Britannia 310, for London-New York, requires a runway of only 7,500 ft. at full load. The increasingly large open spaces required dictate sites more remote than at present: Stockholm's Bromma is five

16% up at 250 miles, 10% at 1,000 miles, 24% at 1,500 miles.

Medium-haul: At design range of 2,500 miles the 575-mph jet is up 6% on the 460-mph turboprop, increasing to 11% at 500 miles and 23% at 3,000 miles. The 375-mph turboprop offers even better; 12%, 25% and 30% respectively.

Longhaul: The turboprop here gains most, with the jet up 8% on 460 mph and 14% on the 375-mph turboprops at the 3,500 miles design range, 17% and 27% on 500 miles, 16% and 28% on 4,000 miles.

First cost of the airplanes is of great importance in assessing such figures and the turboprop suffers because it carries more development costs than does the military-amortized turbojet. Actual airplane costs differ considerably from "formula aircraft," whatever attempt is made to keep them representative.

Although based on single-type experience with only two airlines the comparison of estimated and actual costs of BEA's Viscounts 701 and BOAC's Comet 1 is indicative of what to expect from formula airplane studies.

Average actual airplane costs for the Viscount at mid-life are 21% higher than estimate, compared with a 29% high during the initial learning year. Comet actuals were 61% up on estimate with an extrapolated drop to an excess of 35% at mid-life.

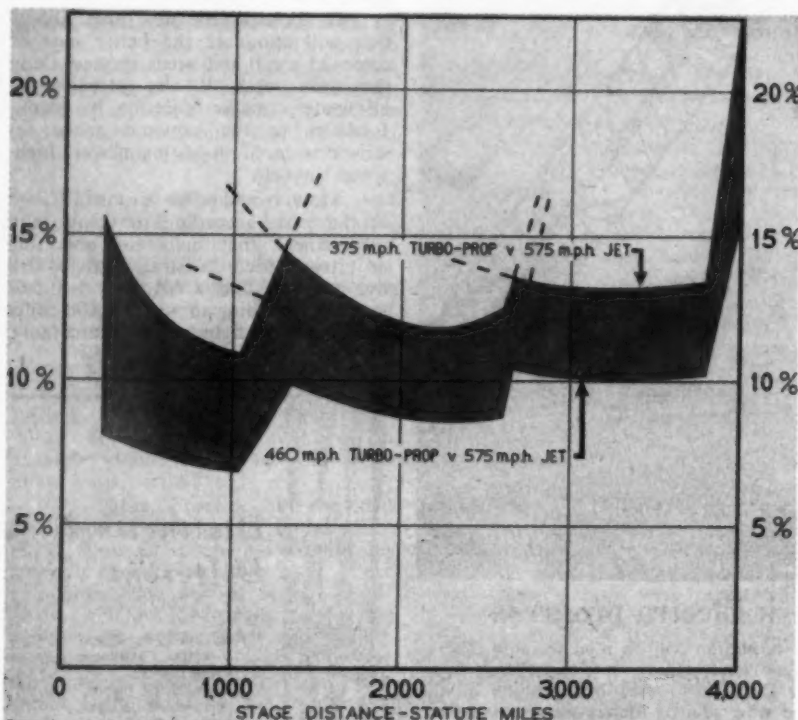
"Comet 1 experience," said Lord Douglas, "indicated operating problems peculiar to the jet airplane: they will be overcome but are likely to impose some penalty on jet services, particularly short-haul." The competitive, passenger-attraction value of the turbine-powered airplane is considerable: Comet services upped BOAC traffic share 47%, Viscount schedules upped BEA share 50%.

Lord Douglas said that the jet airliner will be 10-15% more costly to operate and there will be no competitive block time saving below 1,500 miles.

"Intangibles," some of local significance only, affect the application of these evaluations to an airline—which must simply choose for itself. The entry of the Bristol Britannia into service will have significant results affecting pending decisions.

Showing the present breakdown of airliner orders, Lord Douglas suggested that 1957-70 requirements would be: short-haul 800 jets, 2,500 turboprops; medium-haul 700 jets, 800 turboprops; long-haul 600 jets, 500 turboprops. Jetliner investment, he estimated, would total \$9.8 billion and for turboprops \$8.4 billion.

"The great controversy has yet to be resolved. However, the signs are that, before they pass into history, both jet and turboprop are destined to play essential parts in the further development of world air transport," Lord Douglas declared.



Total costs comparison of jets and turboprops

turboprop is 15% (or more) cheaper per seat-mile. All the other arguments, runway length, flexibility, relative comfort and passenger appeal, etc. are subsidiary issues, although they can affect the final comparison considerably.

Lord Douglas pointed out that stage length greatly affects block speed—and the city center journeys may nullify all but major gains. For a 200-mile stage length the 575-mph jetliner gains 10 minutes on a 375 mph (current) turboprop, only 6 minutes from a 460 mph vehicle; at 500 miles the gains are 25 and 13 minutes respectively; at 1,100 miles 61 min. and 34 min.; while at 2,500 miles (New York-Los Angeles) it becomes 2 hrs. 15 min. and 1 hr. 4 min.

• The next major aspect is the

miles from the city center, but the new intercontinental Ska-Edeby is 14 miles distant.

"This means that a 575-mph jet using the new airport will offer a slower city center-to-center journey to its passenger than a 460-mph turboprop on all stages of less than 750 miles," said Lord Douglas.

BEA made nine "paper airplane" studies to arrive at comparative operating characteristics and costs of short, medium and long haul airliners, to reach these conclusions:

Shorthaul: At design range of 1,000 miles the 575-mph jet is 3% per seat-mile up on the 460-mph turboprop; this increases to 5% at 250 miles, 11% at 1,500 miles. Comparing with the 375-mph turboprop, the jet is

AIRLINE COMMENTARY

Sales, Traffic, Promotion

In conjunction with its new reservations department, **Los Angeles Airways** has established protective limousine service whereby passengers will be transported to Los Angeles International Airport by limo if a helicopter flight is canceled. The limousine service is set up for each flight, regardless of the number of passengers, so that when a passenger makes his reservation on an LAA flight there will be either a helicopter or a limo at the heliport at flight time to transport him to the airport. Now that it is operating its own reservations department, LAA has also established a flight advisory service to notify passengers two hours prior to flight time of any delays or cancellations . . .

Air France has a big campaign under way to attract more American travelers. Full-page magazine ads and window displays state that "more and more Americans fly Air France because they prefer to fly the world's largest airline . . . Americans have discovered, too, that Air France is France aloft" . . .

Most colorful folders received in some time are those describing **Delta Air Lines'** 1957 "Millionaire Dream Vacations"—Miami Beach, Ft. Lauderdale, Caribbean, New York, Washington, New Orleans, Gulf Coast, Mexico, Guatemala, Yucatan. Company has printed 800,000 of them. The vacation program will be launched with four-color full pages in "Holiday" magazine, April issue . . .

Pan American World Airways plans an "all-out" campaign to promote tourism in Latin America this year. Company will spend \$2.5 million on advertising, sales promotion and publicity . . . The 1957 advertising program of Pan American's Atlantic Division will feature equipment, food, service and destination . . . **Cubana** has consolidated all its U.S. advertising, public relations and sales promotion in its contract with Harry W. Graff Inc., 730 Fifth Ave., New York . . .

New **Capital Airlines** direct-mail piece distributed in Washington plugs nine daily Viscount nonstops to Chicago. Capital is described as the "number one airline to Chicago" . . . **Piedmont Airlines** this year will start package vacations, called "Fun-Pak," to Virginia Beach, Va., and Asheville, N. C. . . .

Role of the travel agent is described in "Your Travel Agent and You," a 12-page booklet being distributed by **American Society of Travel Agents**. Among subjects discussed are agents' fees, difference between escorted tours and independent travel, cruises, package vacations, etc. Booklet is available from local ASTA members . . .

American Airlines, in cooperation with Mid-America National Bank, has started "drive-up" air ticket service in Chicago. Tickets arranged for in advance by telephone are prepared at AA's office in the Prudential Bldg. and turned over to the bank's curbside tellers on Stetson Court on the east side of the building. Customers pull up in front in their cars, step into the office and complete the transaction . . . American will train a record 746 new stewardesses this year. And, says AA, if it wasn't for the constant

ringing of the wedding bells, 118 additional girls would do the trick . . .

An "overnight special" from New York to Hawaii has been started by **American and Pan American**. AA's non-stop DC-7 Mercury leaves New York International Airport daily at 4 p.m. for Los Angeles, where it connects with PAA's DC-7C which arrives in Honolulu the next morning at 6:55 . . .

National Car Rental System this year will stress "personalized service," a program designed to give the customer "unexpected specialized services designed to provide the utmost in convenience, economy and flexibility." To tell its story, Nationalcar will more than triple its national advertising expenditures. The organization added 97 new stations and 70 new cities to its list last year. It now has over 400 stations, with offices in more than 200



Satellite Rides as 'Passenger'

AN EARTH SATELLITE unit made its first flight as a seat-occupying "passenger" on a commercial airline. Because of the sensitivity to air and shock of the electronic guidance reference system Minneapolis-Honeywell built for the satellite, the company shipped it to Washington via Capital Airlines. Engineer John Voissem chaperoned the electronic brain on its trip.

cities in the U.S., Canada and 19 other countries and territories . . .

William M. Tetrick, president of **Avis Rent-a-Car System**, predicts that by 1962 car rental will be a billion-dollar-a-year industry . . . **Avis'** counter and sales personnel will shortly be wearing airline-type uniforms, made by Delta Uniforms. New York . . .

Continental Air Lines and Southern Pacific Railroad have entered into an agreement to provide integrated truck-air freight service to most Texas cities served by the truck-rail line. The railroad's Southern Pacific transport company will carry inbound and outbound air cargo between railroad-served points and CAL's terminals in Houston, Dallas and San Antonio . . .

by Eric Bramley

The travel editor of the New York Times, Paul J. C. Friedlander, teed off on the airlines in no uncertain fashion recently. His story had to do with operations in bad weather conditions which caused delays somewhere along the route, failure of airlines to give accurate arrival information, etc. He had just spent two days completing what was scheduled to be a 3½-hour trip and he detailed bluntly the tragedy of errors.

It's certainly true that the recent extended spell of bad weather along the east coast has produced a rash of complaints. Some airline executives recognize the problem, but others stick their heads in the sand and say that snafus are inevitable. And some top managements seem to have removed themselves further and further from the point of contact with customers with the result that passenger handling hasn't been showing improvement. Unless something is done soon to restore a measure of confidence, criticism undoubtedly will mount in the public prints.

Mary Murphy, of AMERICAN AVIATION's Los Angeles office, recently went on a Western Air Lines demonstration flight and sampled one of the company's famed "hunt breakfasts," described on this page some time ago. She wrote a description for her boss, Fred Hunter, and it's quite evident that she was impressed. Such terms as "scrumptious breakfast" and "mouth-watering food" are used, and she notes that the stewardesses' "red weskits had a cheerful effect on the morning traveler." Fred forwards her well-written report to us with the comment: "This is what you might call the feminine viewpoint. You will note she mentions the red weskits worn by the stewardesses, but completely neglects to say what she ate—steak."

The Federal Bureau of Investigation has opened an exhibit at its Washington headquarters on the John Gilbert Graham case. Graham, you'll recall, used dynamite to blow up a United Air Lines DC-6 near Denver. He was executed in the gas chamber. The exhibit contains some of the parts of the plane that were used to determine that an explosion occurred, reproductions of drawings Graham made for the FBI showing how he rigged the timing device, and other interesting items. The FBI lab experts make it almost impossible to commit such a crime and get away with it. Purpose of the exhibit is to show this. We recommend that you visit it when you're in Washington.



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TRANSPORT TRENDS

Existence of CAB's General Passenger Fare Investigation is biggest threat to April 1 fare increases filed by six domestic trunks early this month. Investigation was instituted last year as a direct result of congressional pressure based on arguments that airlines' earnings were excessive. That will be uppermost in minds of CAB members when voting on fare increase tariffs, despite rising costs arguments of most carriers.

Timing will be serious problem for CAB if it suspends the fare increases. General fare investigation has no time limit and could run two more years. Suspended tariffs, however, must be ruled on by agency within 180 days, raising possibility of prejudgment of the fare investigation.

Scandinavian Airlines System's new Europe-Japan over-the-Pole route resulted from long-range planning of a former president, Per A. Norlin, who was not invited to take part in inaugural ceremonies.

SAS will bring a young man without previous airline experience into the company as new president at this month's board meeting in New York. Henning Throne-Holst, current president, will remain in some capacity for a time.

Russia's Aeroflot would like to open jet transport service from Europe to Tokyo via Moscow, Irkutsk and Peking, using Tu-104s, it has been learned on good authority. This route would be highly competitive and shorter than present service, but Russia may have trouble getting rights into Tokyo right now.

Aeroflot also may soon apply for membership in IATA, according to European reports. An open invitation has existed for some years.

Romanian and Bulgarian airlines, which heretofore had only Li2s (similar to DC-3s), have received new IL-12s and IL-14s from the USSR.

MALEV, the Hungarian airline, has been completely reorganized with Communists now in subordinate positions. Former Red manager Zamek has dropped out of picture.

Senate Permanent Investigating Subcommittee still insists it will hold hearings on its investigation of CAB's New York-Florida Case "leak" of last August. But no dates have been set. Meanwhile, case is losing much of its steam; congressional veterans predict that, at most, it will be used as "filler" hearing as Subcommittee devotes most of its time to labor racketeering probe.

Former CAB Member Joseph P. Adams is strongest possibility to head new organization planned by six local service airlines that resigned recently from Conference of Local Airlines. But group is not expected to name a leader until full membership is decided upon. Six carriers hope to get other local lines and some territorial lines interested in their new organization.

INDUSTRY

Bell unveils automatic all-weather carrier aircraft landing system

What was described as the first completely automatic all-weather landing system for carrier-based aircraft was demonstrated on dry land by the Bell Aircraft Corp. at the Niagara Falls, N.Y. Airport Feb. 27.

Bell's President Leston Faneuf predicted that equipment could be available within two years that would enable commercial aircraft to make automatically controlled precision landings even under "zero-zero" weather conditions.

The Bell system, designated ACLS—Automatic Carrier Landing System—was developed under a Navy Bureau of Ships contract. The Navy said more than 1,200 trial landings had been satisfactorily completed on land and that sea trials will soon be started. An Air Force version of the Navy system is being concurrently developed.

The system, under Bell development since 1949, can effectively guide carrier aircraft to landings in all sea states and under all visibility conditions. The landbased version may be mounted in trailers, making it highly mobile.

ACLS comprises ground-based radar and computer units plus a radio link. The aircraft enters a radar window two miles from touchdown for the Navy system, and four miles for the

Air Force system. The radar reports the airplane's altitude and position with respect to the carrier deck or landing strip to computer units.

The computer units compare the airplane's flight path with a previously programmed ideal landing path. A radio link then sends flight-path error signals to the airplane's autopilot, which feeds corresponding corrections into the airplane control system.

At the time the airplane is ready to touch deck, the ACLS automatically corrects for the carrier's movements. If the aircraft is not in the best position and altitude for a safe landing, or if too violent a maneuver is needed, pilot receives an automatic waveoff.

At touchdown, the pilot takes over the controls. A more sophisticated system carries an automatic throttle control. The pilot can at any time override the automatic system.

Bell engineers estimated that with two ACLS's operating simultaneously, aircraft could be landed on a carrier deck at 30-second intervals.

During a sequence of 1,200 automatic landings, only small deviations from the intended touchdown point were experienced. For carrier landings (9 ft/sec sinking speed), lateral deviations were within 10 feet, and fore-and-aft deviations within 22 feet. For flared landings (2 ft/sec sinking speed), lat-

eral deviations were also within 10 feet, and fore-and-aft deviations within 100 feet.

ACLS has successfully landed six different types of aircraft: Douglas' F3D Skyknight and DC-3, North American's F-86 Sabre and B-25 Mitchell, the Convair-Liner 340, and the Cessna 310.

Bell Market Manager Robert Sellers said that a commercial version of the system could be made smaller and simpler than the Navy version, and could be ready in two years. The system would be compatible with existing navigation and approach systems.

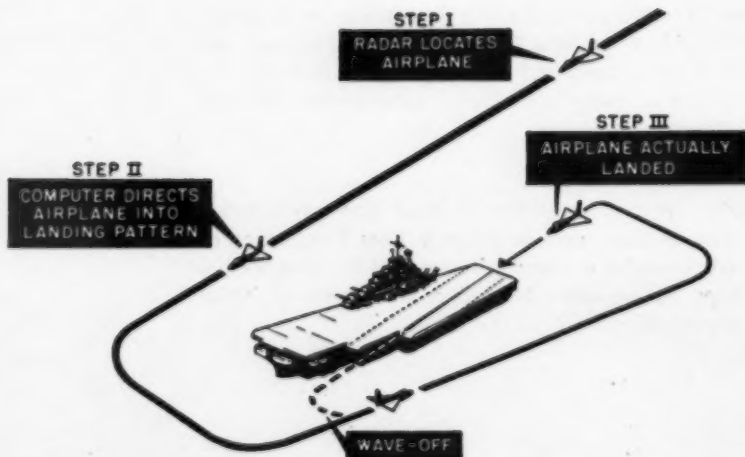
Although three men now administer the ground-based landing equipment, Sellers said that production models would run unattended except for monitoring by aircraft tower personnel. There would be no need for human judgment for the system's satisfactory performance.

An ILS-equipped aircraft bearing a small three-pound aluminum reflector on its landing gear could be automatically landed. Without ILS or other approach equipment any autopilot-equipped aircraft could make automatic landings if it is first equipped with the reflector and a radio link. This link would carry the flight error signals from the ground-based computers to the aircraft autopilot.

It is expected that a satisfactory automatic landing system could appreciably increase aircraft safety. The major factor causing aircraft accidents is bad weather, which takes its highest toll at flight landings. Such landing accidents account for 44% of the mishaps experienced by utility aircraft, 34% by commercial aircraft and 35% by military aircraft.

Sellers said the automatic landing system could make weather a minor flight condition. Tacan would bring the aircraft into the neighborhood of the airstrip or carrier. Between two and four miles from the landing strip, the aircraft would enter the Bell system, he said. At this point, radar would take over the controls and land the airplane.

BELL Aircraft's ALL-WEATHER CARRIER LANDING SYSTEM



Northrop gets contract for supersonic trainer

Contract for production support of the T-38 supersonic trainer has been awarded by the Air Force to Northrop Aircraft, Inc. The contract is for drawings, tooling and engineering for production of the T-33 replacement.

Announcement of the \$2,714,996 contract appeared in the Commerce Dept. daily contract synopsis. It is the first disclosure of the designation of the new trainer which had been called the "TZ."

The T-38 is slated to make its first flight in the summer of 1958 and deliveries are expected to begin in 1959. Early estimates indicate about 400 will be phased into service.

Ejection seat permits bailout at 1,500 mph

Lockheed Aircraft Corp. has developed an ejection seat system permitting safe bailout at 1,500 mph at high altitude or as low as 400 ft. at 850 mph.

New seat resembles present fighter ejection seats but includes several additional features: vertical fins along each side of the back, stub wings and a steel wind deflector mounted on a four-foot boom in front of the occupant. These devices operate when the seat separates from the aircraft.

The vertical fins act as vertical stabilizer, keep the occupant always facing forward. Stub wings are 12 in. long, 8 in. wide. They give lateral-direction stability and eliminate pitch and roll effects.

The seat, now undergoing test at Air Force's high-speed test track at Hurricane Mesa, Utah, can cut "G" loads on pilots more than 50% and eliminate tumbling. Weight is 35 pounds more than current seats. Operation requires only one movement for activation. Stanley Aviation Co. of Denver has received a contract to build six test seats. First production models are expected in mid-1957.

December contracts total \$1.734 billion

Contracts totaling \$1.734 billion for aircraft, missiles, drones and related items were placed during December by the military services. This was the highest obligation rate for these items recorded in any month of the first half of fiscal 1957 beginning July 1.

Cumulative obligations for the six months stands at \$5.6 billion.

Bulk of the contracts placed in December were by the Air Force. It placed \$1.55 billion, bringing its cumulative total for six months to \$4.224 billion. Navy placed \$183 million in contracts during the month to hike its total for the half-year to \$1.376 billion.

The two services paid out \$814 million during December, raising the six-month expenditure total to \$4.35 billion. AF paid out \$644 million and Navy \$171 million, making the cumulative six-month outlays for the two services \$3.4 billion and \$948 million.

Doman replaces Waters in management shakeup

Top management shakeup at Doman Helicopters, Inc., Danbury, Conn., has resulted in the resignation of Donald S. B. Waters, former president, and reduced the membership in the Board of Directors to six.

Replacing Waters is Glidden S. Doman, chairman, who served as president since the founding of the company

in 1945 until Oct. 1, 1954, when Waters took the post.

The six remaining on the board of directors are: Doman, Gerald F. Finley, Louis R. Ripley, Donald K. Phillips, C. Gerald Dodge and Stephen DuPont. Leaving the board were Waters, Harry L. Brown, former treasurer; Robert Neelds, test pilot; J. F. Monroe, Thomas C. Zeerep, who remains director of manufacturing; and Raymond G. Dugan, who remains director of procurement and becomes assistant treasurer and assistant secretary.

Harry L. Brown resigned as Doman treasurer in January. He was succeeded by Arthur R. Tallardy. Finley remains vice president and secretary as well as director.

Doman has been unable to secure production orders for its H-31 helicopter, although the Army is now evaluating a YH 31.

Douglas '56 sales set record: \$1,073 billion

Record sales of \$1,073,515,000 during fiscal 1956, including \$140,000,000 in missiles, was reported by Douglas Aircraft Co., Inc.

The Douglas net came to \$33,202,000, equivalent to \$8.96 a share, compared with \$7.65 a share the year previous. Backlog stands at \$2,209,049,000, almost equally divided between military and commercial orders. Half the commercial total consists of orders for DC-8 jet transports, the balance for 267 DC-6/7 piston engine aircraft.

Harold E. Talbott, former AF Sec'y, dies

Former Air Force Secretary Harold E. Talbott, 68, died March 3 while vacationing at Palm Beach, Fla.

Talbott became AF Secretary in 1953 at the start of the Eisenhower Administration. He held that post until 1955, resigning after a Senate investigation into his outside business connections.

CAA approves Lycoming engine for Cessna 170

Approval for installation of a 170-hp Lycoming O-340-A1A engine in a Cessna 170 has been granted by the CAA to Doyn Aircraft, Wichita, Kans.

The Lycoming engine is lighter than the one it replaces (145-hp Continental) yet provides an additional 25 hp, reports Galen D. Means, Doyn president and chief engineer. Performance data emphasized by Doyn include: Cruising speed 147 mph at 6,000 ft., 75% power; sea level rate of climb at gross weight, 1,000 ft. per minute; takeoff run shortened 25%; service ceiling at gross weight 18,250 ft.; absolute ceiling at gross weight, 20,300 ft.

BRIEFS

Eastern Air Lines reports net income of \$14,197,500 for 1956 based on preliminary unaudited figures. This compares with \$9,342,791 earned in 1955. Gross revenues totaled \$228,040,200, up 14.8%, while expenses climbed \$27,526,800, a 16% jump from \$172,083,579 in 1955.

Capital Airlines reports a net loss of \$1,795,269 for 1956 although its revenues included \$2,455,946 from sale of aircraft. A year before the carrier had a net profit of \$4,562,276 which included \$4,559,591 income from planes. Operating loss in 1956 was \$2,864,368 while 1955 showed a profit of \$325,341.

Northeast Airlines' board of directors has renewed contract with George E. Gardner as president and director for another three years. The contract is effective immediately and runs to Dec. 31, 1960. Gardner has been with NEA since Nov. 10, 1947 as president.

Flying Tiger Line reports a net loss of \$273,791, after special items, from operating revenues of \$10,346,610 during the first six months of fiscal year ending June 30, 1957. The year before the line had gross revenues of \$10,886,299 netting income and special items of \$660,773—equal to 84 cents a share.

Rohr Aircraft Corp. realized sales of \$52,963,310 for the six months ending Jan. 31. Earnings after taxes amount to \$1,717,773 or \$1.90 per share, up from a year ago figures of \$42,578,627 sales, net earnings of \$1,312,350 and \$1.46. Backlog Jan. 31 was \$216,639,000 compared to \$144,736,000 a year ago. About 35% of backlog is commercial.

Pacific Airmotive Corp. operations for the year ending Nov. 30 resulted in net profits after taxes of \$921,420 or \$1.40 a share. In 1955 a net loss of \$8,378 was realized. Sales for fiscal 1956 were \$21,254,921 compared to \$20,446,827 for 1955.

Breeze Corporations, Inc., Union, N. J. reports that profits of the last four months in 1956 reduced its net loss for the year from \$812,972, before tax credit, to \$129,542. Net loss for 1955 was \$321,009. Net sales were up from \$10,087,712 in 1955 to \$11,541,515.

Jack & Heintz, Inc., reports 1956 net income of \$1,230,906 and additional income of \$340,606 resulting from tax adjustments. Total income: \$1,571,512. Earnings per common share were \$1.72. Sales were \$24,417,887, down from \$29,977,478 the year before.

Solar Aircraft Co. has received a \$12.2-million order for J57 engine components, supplementing earlier orders from Pratt & Whitney Aircraft Co. and Ford Aircraft Engine Division.

Navy's supersonic surface-to-surface missile, Regulus II, hits Mach 1.5, reaches 50,000 feet

The Navy has pulled the wraps from its supersonic Regulus II ship- and submarine-launched surface-to-surface missile. It disclosed that the new Chance Vought weapon can hit Mach 1.5 and altitudes of better than 50,000 feet.

The missile is 57 feet long, approximately six feet in diameter and has a wing span of about 20 feet. It is a direct outgrowth of the Chance Vought Regulus I, a Mach 0.98 surface-to-surface missile 31 feet long with a span of 21 feet. Regulus II is said to weigh approximately twice as much as its 6-ton predecessor.

"GM-2007" was the designation of the Regulus II placed on display at the Sheraton Park Hotel in Washington, D. C., in connection with a Navy League meeting March 1. Numbers beginning with 2001 are applied to the advanced Regulus, while the "7" indicates that the weapon is the seventh in the series of test vehicles constructed by Chance Vought to test the concept.

Powerplant for the Regulus II production missiles will be the General Electric J79 turbojet engine, which also powers the Lockheed F-104, Convair B-58 and Grumman F11F-1. Test vehicles employ the Curtiss-Wright J65 engine.

The Regulus II features a canard stabilizer just aft of the nose, swept wings with extremely sharp leading edges and a very large belly air scoop. There is no horizontal tail stabilizer. Test vehicles are equipped with tricycle landing gear and are said to land at approximately 250 knots on full afterburner with both elevons down.

Rear Adm. John E. Clark, Navy Missile Director, said the range of the Regulus II is less than that of the 1,500-mile intermediate-range ballistic missile, and most observers put it at approximately 1,000 miles.

Although it is very close to the Air Force's 69-foot subsonic Snark in size, officials said the Regulus II cannot match Snark's 5,000-mile range because of the heavy accent placed on speed. They added that the Air Force has expressed interest in the Regulus II.

Thirteen Regulus II test flights have been carried out at Edwards AFB, Calif., six of them with the same vehicle, Clark said. The average is nearly four flights per missile, he added. Tests have been temporarily discontinued at the Edwards dry lake because of rain, but they will resume in the spring.

The Navy is presently converting two submarines to handle the Regulus II. These will feature a partially recessed "hangar deck" on the top side. In addition, it is building a nuclear-powered submarine, the Halibut, at Mare Island which will have an internal hangar large enough to accommodate Regulus II. The latter vessel will be completed about mid-1959.



REGULUS II TEST VEHICLE in flight. Like its predecessor, Regulus I, it has no horizontal tail stabilizer, but Chance Vought has supplied a canard stabilizer just aft of the nose. Test models use Curtiss-Wright J65 engines; production versions will use the General Electric J79.



CLOSE-UP OF REGULUS II's very large air scoop. Note smaller shovel-shaped inlets above engine intake. Air from the small inlets is led . . .



. . . through large open ducts built into the fuselage and emptied beneath each wing from slots marked "boundary layer exits." Arrangement may serve as a supersonic fillet to minimize wing-fuselage interference.



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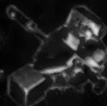
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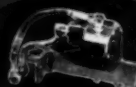
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SAM SAINT SAYS

**At 7,000 feet, this near-miss
happened to ME.**

WHEN a near-miss happens to someone else it's a statistic. When it happens to you, it's different.

Tonight we taxied out at a certain airport. A DC-6 Aircoach, destination LaGuardia. It was snowing a little, the ceiling a ragged 800 feet. After a 25-minute wait we finally got an airways clearance. We took position on the runway for a southwest takeoff. The tower asked us if we could cross an omni range south of the airport at 7,000 feet. We asked if they were going to follow us on radar. The tower said, "No." At this we said, "We can't be sure of crossing the omni at 7,000." The circuit was silent for a minute; then we were cleared for takeoff, "left turn direct to the (specified) omni." No altitude restriction at the omni.

Off the ground we did the things pilots and engineers do on nights like this: pitot heaters, wing heaters, prop de-icers on, swing left to 160 degrees on a direct course to the omni. I flipped the landing lights off as we pushed up into the cloud.

There were several planes on the frequency. We reported vacating altitudes in the climb to let other traffic out behind us. With outbound delays running 25 to 40 minutes, the chatter on the tower and center frequencies was constant. On solid instruments, with no need to keep a traffic watch, we relaxed. Coffee.

We hit the omni at 5,500 feet climbing, started a left turn onto a victor airway. About 15 seconds later the co-pilot and engineer sang out simultaneously, both pointing ahead and to the left. The flashing lights of another airplane were angling toward us—and closing fast! I stopped the turn and the other plane went by a few hundred yards on our left. We had seen the other aircraft because we were intermittently breaking out of the top of the cloud deck. The few seconds of visibility had come at the right instant.

I didn't register at first. Automatically I picked up the mike and asked the Center Controller if he had traffic over the omni at 6,000 feet. The controller didn't answer. A few seconds later an airborne voice reported over the omni in question at 6,000 on a crossing course.

Then it began to sink in. If I had continued in the turn—as I would have

without those seconds of visibility—it is likely we would have hit.

I asked the Center to repeat the identity of the other flight. The Center didn't answer although we knew the strip was there in front of the controller. My co-pilot repeated the question. Again no answer. I found myself visualizing what must be going on in the controller's mind: Who slipped up? Center? Tower? There would be investigation of the record, letters, disciplinary action.

Surprisingly I found myself sympathizing with this unknown controller. Someone in the Tower or Center would be blamed for a mistake that could have cost a hundred lives. But, from my years of studying the ATC problem, I knew, as the controller knew, that the real fault lay in the incredibly inadequate tools he is forced to use—hand-scribbled notes on scraps of paper, hurried words on phone circuits, easily misunderstood. Pressure, continual pressure to keep traffic moving.

As we leveled off and cruised east in the clear night sky above the clouds, my thoughts turned toward home where my five-year-old boy lives for the moment his Daddy walks in the door. There is a fort to be built with card table and blankets on the living room floor. I wondered how long it would have taken for newsmen with their flashbulbs to come knocking on the front door.

Gradually a dull, frustrated anger built up inside—anger, not at the Controller who went home to his family nervous and exhausted, but at the small men in big jobs who, year after year, have senselessly prevented the development of modern, interlocked control displays to ease the controller's workload and prevent these hazardous mistakes.

I'll give some chapter and verse on that last statement in this column in the next issue.

P. S. I talked with the Center Chief involved. He explained how the mishandling of one paper strip had caused the near fatal error. In the end I didn't have the heart to name the Center or the Controller involved.

Airport Space and Facilities



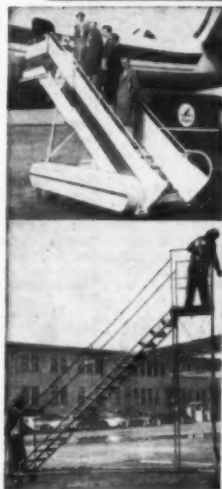
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MANUFACTURING

Name	New Position	Former Position
Perry W. Pratt	Asst. engrg. mgr., Pratt & Whitney Aircraft's Connecticut operations	Chief engr.
Willard L. Gorton	Chief engr., Pratt & Whitney Aircraft's Connecticut operations	Asst. chief engr.
John R. Church	Dir. aviation sales, AC Spark Plug Div., General Motors	Sales coordinator
Robert J. Clark	Dir., European office, North American Aviation	Coordinator with Navy Bur. Aeronautics
Norman F. Trost	President, Narmco Mfg. Co.	Sales mgr., General Motors' AeroProducts Div.
Carl W. Bollum, Sr.	Engineering asst. to gen. mgr., Fairchild Guided Missiles Div.	Deputy chief, Army Ballistic Missile Agency's Washington office
J. Kenneth Fye	Production supv., The Walkirt Co.	With Pacific Telephone and Telegraph Co.
Irvin Medgebow	VP-contracts, Kellett Aircraft Corp.	Sales mgr.
Dr. Louis F. Doty	Head, Aerodynamics Dept., Aircraft Armaments, Inc.	Supv., weapons systems planning, General Electric Aircraft Nuclear Propulsion Dept.
Radm. Curtis S. Smiley (USN Ret.)	VP, Sterling Precision Corp.	Asst. to the president
Charles W. Manly	Dir. sales and service engrg., Modern Plastics	With Pan American Airways
Francis W. Dunn	Asst. to pres., Bell Aircraft Corp.	Dir. pub. rel. and advertising
Paul W. Norris	VP and gen. mgr., Denison Engrg. Div., American Brake Shoe Co.	VP and asst. gen. mgr.
Denison Neale	Dir. of sales, Denison Engrg. Div., American Brake Shoe Co.	Asst. dir. sales
Warren E. Swanson	Mgr. R&D, Los Angeles Div., North American Aviation	Chief of dynamic science
J. F. Forster	Exec. vp, Vickers Incorporated	VP and asst. gen. mgr.
Charles Foley	Project sales engr., Skinner Div., Bendix Aviation Corp.	Aviation Div. mgr., Fram Corp.
William T. Taylor	Chmn. of board, ACF Industries	Director
Walter D. Hart	Asst. sales and engrg. mgr., aviation div., Kelsey-Hayes Co.	Official of AF Missile Div., Wright-Patterson AFB
John F. Taggart	VP in chg. customer relations, Century Engineers	Mgr., St. Augustine Modification Center, Fairchild Aircraft Div.
Virgil E. Caldwell, Jr.	Dir. sales and contracts, mfg. div., Topp Industries	Midwestern representatives
George Prusha	Project leader, Designers for Industry	Sr. electronic designer
Ted H. Smith	Project mgr., electronics div., Designers for Industry	Developing test equipment, Gov't Guided Missile Program
George Bales	VP-engng., Arkwin Industries	Chief of R&D
Edwin G. Chapman	Mgr., experimental div., Misco Precision Casting Co.	Plant sup.
Dr. Harvard L. Hull	Gen. mgr., Litton Industries of Maryland	VP, Litton Industries, Inc.
Louis E. Benitez	Dir. customer relations, armaments systems, Crosley Div., Avco Mfg. Corp.	Asst. to dir., Research and Advanced Devel. Div.
Thomas J. Michel	Dir. customer relations, electronic systems, Crosley Div., Avco Mfg. Corp.	Mgr. systems engrg.
Perry Smith	Dir. commercial sales, Crosley Div., Avco Mfg. Co.	Administrative dir., Research and Advanced Devel. Div.
Paul O. Momenteller	Gen. sales mgr., LearCal Div. of Lear, Inc.	Commercial sales mgr.
Andrew F. Haiduck	Exec. vp, Lear, Inc.	Exec. vp, manufacturing
Charles E. Arnold	Mgr., Avionics Laboratory, Sylvania Electric Products Inc.	Tech. mgr.
Russel A. Schlegel	Gen. sales mgr., Weston Electrical Instrument Corp.	Sales mgr., industrial sales div.
Edmund C. Sulzman	Gen. sales mgr., aviation and ordnance div., Weatherhead Co.	VP-sales, Jack & Heints
Herbert A. Finke	Gen. mgr., Polytechnic Research & Development Co.	Mgr. of operations
Norman J. Asher	Head, operations research group, Vertol Aircraft Corp.	Administrator, research and prelim. design
Edward J. Gorman	On admin. staff, Vertol Aircraft Corp.	Spec. advisor to Asst. Chief of Procurement, Bur. Aeronautics, USN
Eugene J. Venaglia	Mgr., Sperry Rand Corp.'s new Electronics Laboratory	Mgr., Microwave Electronics Div.
W. R. Miller	VP, Longren de Mexico, Longren Aircraft Corp.'s Mexican corp.	Dir. mfg.
E. Philo Davis	Mgr. adv. and sales promotion, Hoffman Laboratories	Mgr. adv. and sales promotion, Hughes Aircraft's Semi-Conductor Div.

AIRLINE

Orville N. Lipscomb	Purchasing agent, Continental Air Lines, Los Angeles	Purchasing and stores division
Adm. Selman S. Bowling	Dir. communications, Slick Airways	Adm., U.S. Navy
Paul Burroughs	Adv. mgr., Air France	Adv. mgr., American Export Lines, for Europe
Adolph Soroco	Eastern dist. ticket offices and stations mgr., Air France	In chg. Fifth Ave ticket office
Robert S. Lipp	Secy., Eastern Air Lines	Asst. secy.
G. Wesley Channell	Asst. vp, Eastern Air Lines	Member of law firm of Gambrell, Harlan, Russell, Moye & Richardson, Atlanta
Carl A. Wallen	Asst. secy., Eastern Air Lines	Revenue accounting

GOVERNMENT

Howard C. Holmes	Dir., Aluminum and Magnesium Div., Business and Defense Services Admin., Dept. of Commerce	On loan from Kaiser Aluminum and Chemical Sales, Inc., Chicago
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the bulletin board

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FACILITIES

Texas Instruments, Inc., is building a 12,000-sq. ft. facility to house its newly formed subsidiary, Texas Instruments Ltd., at Bedford, England. Completion is slated for June.

Detroit Controls Corp. is erecting a new million-dollar structure at the Control Engineering Unit, Norwood, Mass. Building will be completed in April and will allow the unit to double its staff.

Convair will lease a new 100,000-sq. ft. building for engineering office space for some 1,700 employees near the Convair-Fort Worth plant. Occupancy is slated this summer.

Scott Aviation Corp. has added 6,000 sq. ft. to its facility at Lancaster, N. Y. The new office building will house sales, purchasing and production control departments.

Hamilton Watch Co.'s Hathaway Instrument Division is occupying a new 45,000 sq. ft. plant at 5800 E. Jewell Ave., Denver. The plant includes a two-story office building, engineering laboratory and an attached one-story factory area.

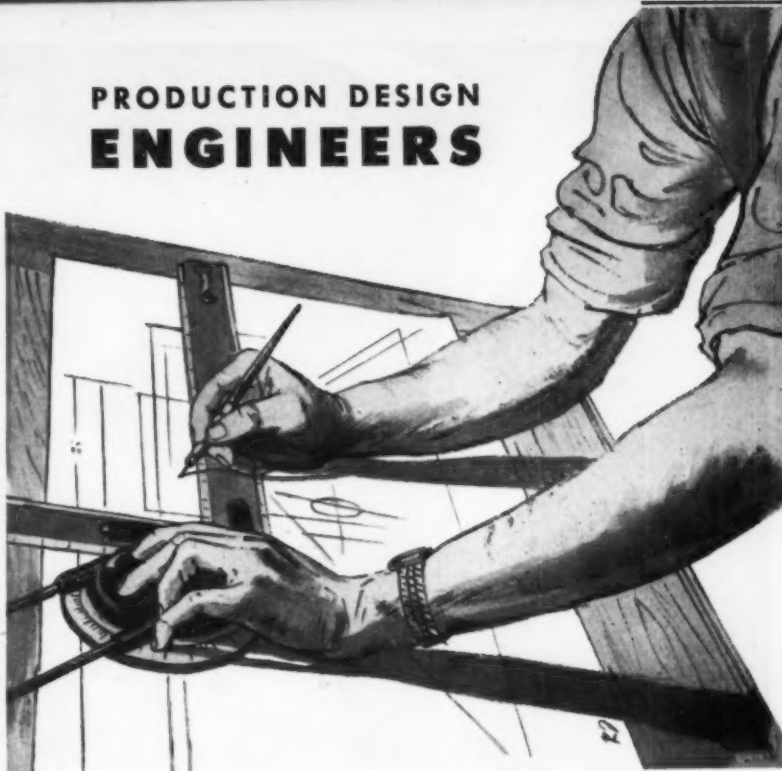
Magnetic Research Corp. has opened its second facility, the Engineering and Special Products Division in Hawthorne, Calif. The 20,000-sq.-ft. plant represents a fourfold increase in area for the company.

North American Aviation, Inc., will open a European office at Geneva. Temporary space has been leased at the Hotel du Rhone until permanent offices are ready.

North American is building a \$1.4 million windtunnel at the Columbus, Ohio, division. The tunnel will be a low-speed installation to test small aircraft models at velocities up to 300 mph. Completion is slated for January 1958.

Edo Corp., College Point, L. I., N. Y., has formed a wholly owned subsidiary, Edo (Canada) Ltd. The company has purchased 10 acres two miles east of Cornwall, Ontario. New plant will be ready for use by September. The company builds electronic equipment and aircraft components.

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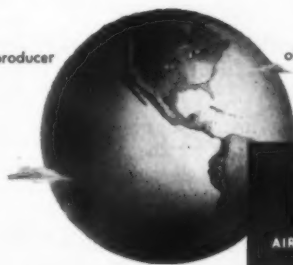
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EN ROUTE

by Wayne W. Parrish

Flying High from Leopoldville to Brussels

(The Champagne Helped)

I guess I'm an incurable romantic but I still get an enormous kick out of certain international flights. It seems awfully trite to keep saying that the airplane has shrunk the world and internationalized everything, but it's all very true.

Just take that flight on Sabena from Leopoldville in the Belgian Congo to Brussels last June. It was one of the best I've ever had. It would have been good even without the extra champagne.

At the Leo terminal everything was chaotic as it always seems to be at an airport in the hot tropics. Employees running around, families and kids everywhere. The clatter and chatter were terrific. Since I always dress for my destination, I was more uncomfortable than ever in a worsted suit. I got through customs and immigration and stood out near the gate protected from the sun and watching the servicing of my DC-6B which had originated in Johannesburg, South Africa.

I made note of one Sabena procedure which could well be copied elsewhere. In customs you put your overnight and other hand-luggage on a cart which was later rolled out to the plane steps and you picked up your stuff when boarding. A great relief to be rid of the handbags while waiting around for departure.

Takeoff was on time and in minutes we had crossed the Congo and climbed high over the tropical cumulus on our way to a night stop at Kano in northern Nigeria.

I was in the front left seat of the first-class compartment in the rear. The only empty seat was next to me. In the forward compartment was a full load of tourists, mostly families returning to Europe. So far as I could learn, I was the only American.

Cosmopolitan Travelers

My fellow first-class passengers were a cosmopolitan lot, some South Africans with thick British accents, a few Belgians, a bewhiskered and be-robed priest returning from the Congo, and others of unknown nationality.

The seat-belt sign was in French and English. The loudspeaker announcements were in French, Flemish and English. The plane was built in Santa Monica,

Calif. The engines came from Connecticut, the spark plugs from Toledo, Ohio. The crew were Belgian. Behind me I heard a British accent say "If I had a free choice of cars I'd buy a Studebaker." At least half the conversation was French.

The steward brought me a Paris edition of the *N. Y. Herald Tribune* only two days old, and a *Rand Daily Mail* published only that morning in Johannesburg. Also a recent copy of my favorite news magazine, *Time*. I was wearing a shirt made of Dacron and Egyptian cotton, and my tie was Italian and shoes English. A pesky fly was making a nuisance of himself hovering about me and I wondered whether it was South African or had boarded in the Congo. I duly pondered his fate up north if he escaped my swatting.

It was mid-afternoon when we took off but since the sun goes down promptly at 6 o'clock every night in that area, dusk came rapidly. I noted a plaque on the bulkhead of our cabin reading "Club des Gastronomes" and I didn't have to wait long until a very prolonged first-class meal service began getting under way.

On my seat tray the steward laid out a real linen tablecloth and real silverware. Then came an aperitif, my choice being a dry martini. After that were hors d'oeuvres accompanied by very excellent white wine. There were three choices of entree, braised ham, filet mignon and mixed grill, so I took the filet mignon along with excellent red wine.

Ah, What Champagne!

After that came a rich dessert and fruits and cheese and coffee accompanied by Pommery champagne and liqueurs. And let me tell you young people that after the champagne there just wasn't anything too good I could say about flying over the treacherous jungles of Africa. The DC-6B had quite a time maintaining the same high altitude as yours truly and the notes I made at the time were truly inspiring if I could only make out now what they said.

But one of the most remarkable things about this portion of the trip is that we entered a tropical storm that was no little April shower. The lightning was terrific and we got some buffeting. But the dinner service never stopped or

even slowed up. And nobody on board could have cared less about the storm. As for the service, it was impeccable, an all-time high record as far as I'm concerned. That steward knew his stuff.

And so about 9 o'clock we landed under a three-quarter moon at Kano, remembered by many U.S. airmen of World War II, in black Nigeria. We walked down handsome lighted steps to the rather miserable one-story building that serves as a terminal, and most of the passengers including me began trading with a half-dozen robed native merchants who had their wares out for display in front of the terminal. Either because of the champagne or my futile efforts to out-trade these sharp Moslem merchants, I ended up with a lot of leather bags and hassocks and whatnot that I scarcely needed. I re-boarded my plane looking like a typical American tourist arriving in Miami from a Caribbean cruise.

And So to Bed

Then to bed in an upper berth for a long haul to Switzerland. Nobody wakened me in the morning and, when I finally came to, I discovered we were over France and descending to Geneva. I rang many times for somebody to bring the ladder but no response. I managed to get dressed just in time for landing and hopped down from the berth.

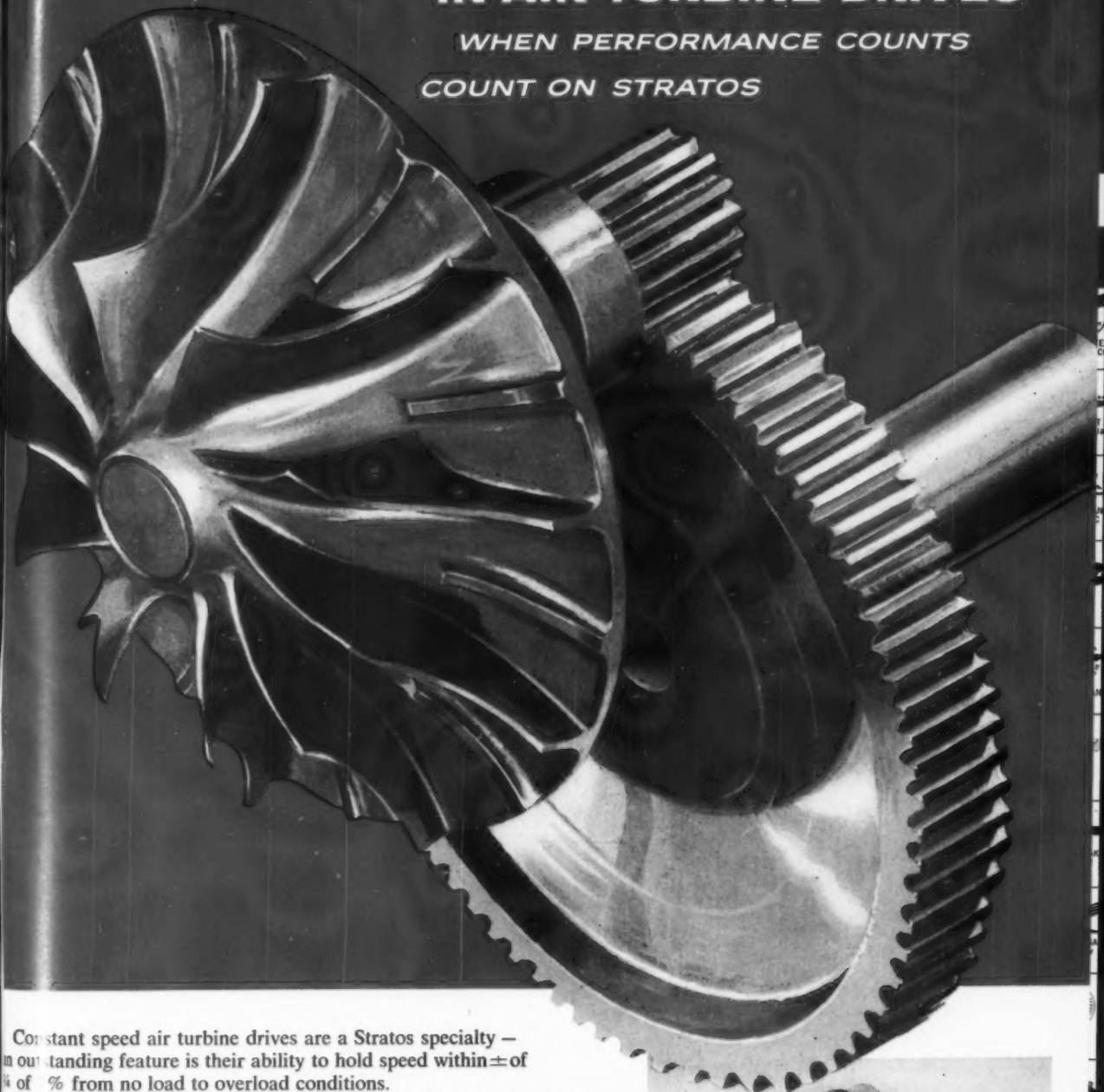
Then into the Geneva terminal for breakfast and let me say here and now it was the worst and most disgraceful service I've ever seen anywhere in the airline business. First-class and tourist passengers were mixed together, the crew kept to themselves in the same room and got first service with superior food to ours (extremely bad impression).

After 25 minutes we still had nothing to eat. It had been 20 minutes before bread and butter arrived but we had no plates. At 30 minutes still no coffee. Kids and babies were crying, everybody was irritable. My coffee arrived 35 minutes after I sat down. But the crew which had made such an impression on me the night before kept eating their fine breakfast and paid no attention and did nothing to get action. The Geneva airport help were indifferent and disagreeable to the nth degree. What a letdown!

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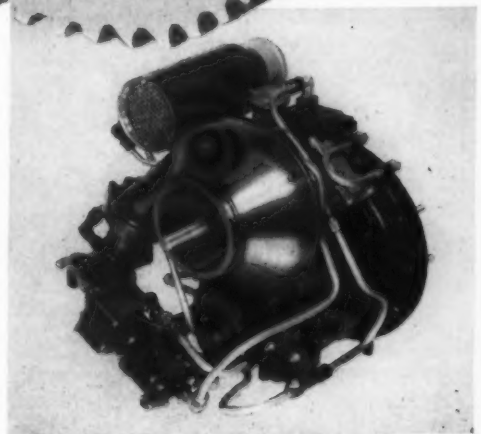
A DIVISION OF FAIRCHILD ENGINE & AIRPLANE CORPORATION



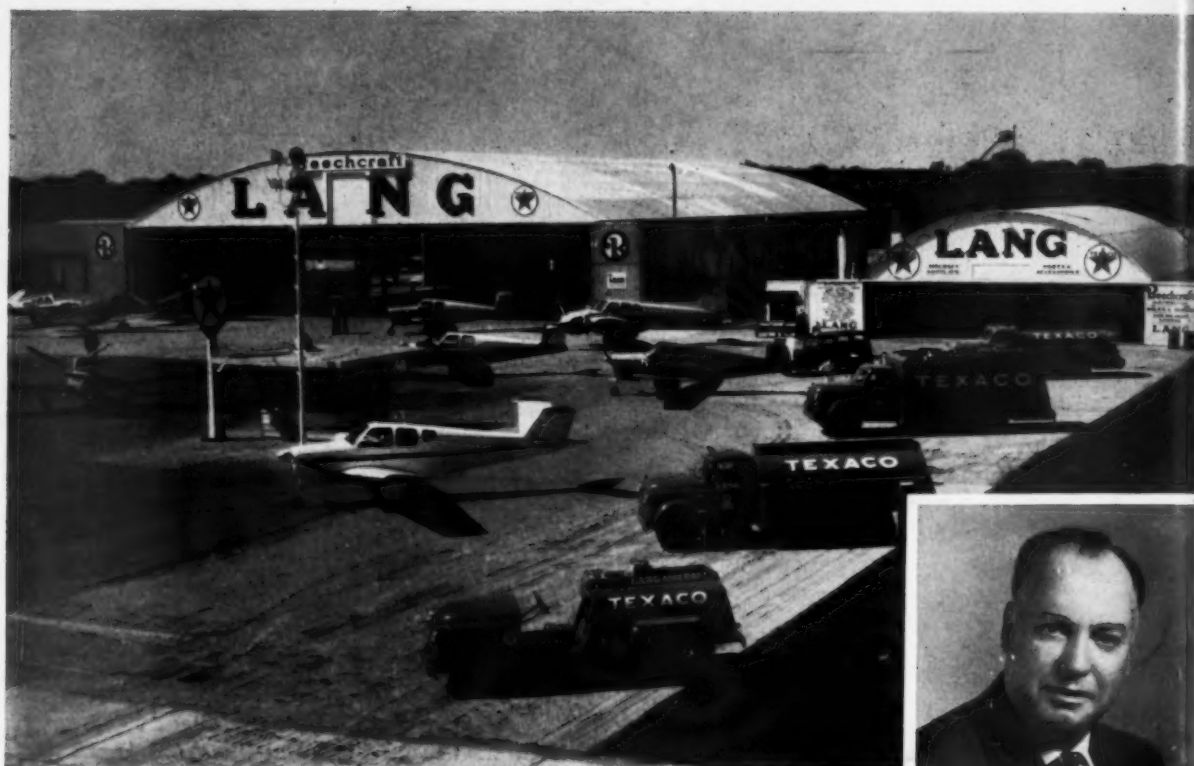
Main Plant: Bay Shore, L. I., N. Y.

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Model TP25-1, for driving a 15 kva alternator



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